THE

Photographer's Companion

BEING A COLLECTION OF

HINTS, EXPEDIENTS, AND FORMULÆ,

SYSTEMATICALLY ARRANGED AS
A SUPPLEMENTARY REFERENCE BOOK FOR USE
IN THE STUDIO AND DARK-ROOM.

BY

EDWARD DUNMORE.

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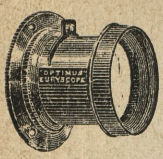

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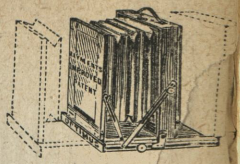

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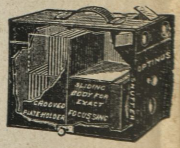

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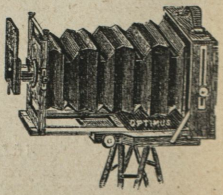

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INTRODUCTORY.

THE AUTHOR, in submitting this small volume to his photographic *confrères*, does not propose to make it a complete book of instructions, or a history of the progress and practice of the art, but rather a supplementary reference book, in which hints and expedients that have been found useful on many occasions may be referred to without involving much trouble or waste of time in searching various publications, it being presupposed that those consulting it are more or less familiar with the usual routine of photographic practice. The various formulæ, suggestions, and modes of dealing with the processes touched upon, have been used and found not merely theoretically correct but thoroughly reliable in actual work, and can be confidently recommended in those cases where the information given is such as is desired.

It must not be supposed that any hint, however good, can satisfactorily be substituted for the exercise of reasonable judgment, as sometimes a very trifling difference in manipulation will altogether vitiate an experiment, although the process on the whole may

seem to have been accurately performed. With these few words of introduction, this reference book is placed before his friends, trusting it may be found a useful companion in their daily work, by

THE AUTHOR.

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THE

PHOTOGRAPHER'S COMPANION.

CHAPTER I.

The Daguerreotype—Cleaning and Restoration—Copying—Bath Cork—Adjusting and Lighting—Buff Lines—Reflections—Respecting Colour—Method of Copying.

THE first method by which photography was made popular was the Daguerreotype, a process most delicate and beautiful, but now practically obsolete. It is, however, necessary to refer to it, and give a sketch of the process, on account of these pictures being frequently brought to the photographer to be restored or copied. To be brief, a delicate layer of iodide, or iodide and bromide of silver, was formed on a highly polished silver surface, usually silvered copper, and developed by the vapour of mercury, the fumes of which, generated by the heat of a spirit lamp, condensed on those parts of the film altered by the act of exposure to the light in the camera, and gradually developed the image. This delicate picture is fixed by immersion in a solution of hyposulphite of soda, washed, dried, and mounted by being closely attached by strips of gummed gold-beaters' skin to a piece of plate glass, a gilt matt being usually inserted between them, and the

whole placed in a leather shut-up case. It was soon found, as the process became more largely practised, that the addition of bromide to the iodide was a great improvement, increasing both the delicacy and rapidity of the process, and that by submitting the image to the effects of a solution of hyposulphite of gold and soda it was much less liable to damage by friction or oxidization. This was termed 'gilding' the image, and was almost universally practised in the latter days of its popularity.

It is wise when a photographer obtains a commission to restore a Daguerreotype, to give his customer clearly to understand that he will *not* be responsible if the Daguerreotype suffers damage or defacement in any attempt to restore it, for sometimes, on the application of the necessary means to remove the oxide that often nearly obliterates the picture—providing it has not been 'gilded'—not only will the oxide or discolouration be cleared away, but the image too, leaving nothing but the mirror-like surface of the silvered copper. On the other hand, when 'gilded,' the oxide can be removed without danger to the image, which once more appears in almost its pristine beauty, and has, practically, another lease of life. There is no means of discriminating between the gilded and ungilded by mere examination—at any rate by modern photographers who are not versed in the process—hence the policy of caution. Whenever a Daguerreotype has to be cleaned, it is best to test it, as far as one can, by carefully applying a weak solution of potassium cyanide with a camel-hair pencil to the most unimportant part and watching the result; if the image is destroyed, it is useless to proceed

to the treatment of the whole picture; but if, on the contrary, it becomes brighter, and loses the bluey, smoky appearance it had, we may safely pass it through the necessary manipulations.

We will suppose a Daguerreotype is placed in our hands to be cleaned and restored, not having been tampered with by being separated from its protecting cover, or by attempted cleaning by unskilled persons. The first thing to do is to separate the metal from the glass by carefully cutting through or scraping off the binding, which is frequently defective, and in addition to oxide has an appreciable amount of smoke and dust on the surface. With a very clean and soft camel-hair duster remove this, and then proceed with the tentative experiments alluded to. If it is found 'gilded,' make a solution of potassium cyanide of about ten grains to the ounce of distilled water, and immerse the Daguerreotype in it, holding the edges between the finger and thumb; have a bowl of clean water close at hand, and as soon as the picture looks fresh and bright, plunge it into the water and move it rapidly about to wash off the cyanide; it must now be finally washed in distilled water, and dipped in rectified spirits of wine perfectly bright and clear; then drain, and finish by holding it in a sloping direction over a spirit lamp, and warming the *upper part first.* The matt and glass cover having been cleaned and polished, they may be placed together and bound firmly, as in mounting lantern slides, but with *strong gold-beaters' skin*, as this forms a better protection from the air than ordinary paper.

If a Daguerreotype is merely washed in ordinary water and dried, there will be formed a kind of veil, or

drying marks, on the surface, very detrimental to the appearance. Even with distilled water and spirit, considerable deftness is required to prevent the formation of drying marks; should they appear, the process of washing and drying must be gone over again, as it is no use, or worse than no use, to attempt removing it in any other manner.

Copying Daguerreotypes.

Remove the picture from the glass cover, dust it carefully with a soft camel-hair brush, then, by the aid of pins, fix it against an upright surface. Nothing lends itself to this so well as a slab of cork, usually termed bath cork—a piece of cork an inch and a half or so in thickness and from eighteen to twenty-four inches square—the smooth surface of which is particularly useful and convenient to pin metal, glass, or cards to for copying; it is infinitely better than the familiar board, which if hard is responsible for a good deal of bad language and bent pins, to say nothing of damaged finger-ends and photographs. A drawing-board covered on one side with cork, such as used by entomologists, glued smoothly on, forms a capital support. The Daguerreotype being fixed up, proceed to get the focus, whether for reduction, enlargement, or same size, and place the camera in position for work.

Remembering that the Daguerreotype is to be replaced in the same position with regard to the camera, take it from the cork support and turn it about in the light, examining it carefully. A number of fine lines or scratches will be seen running across the picture, either tolerably straight or curved; these are termed

'buff' lines, and are frequently a source of considerable trouble, especially in enlargements. 'Buff' lines are the scratches produced by the polishing 'buff' or pad, on the silvered surface of the copper. It is absolutely necessary in lighting the picture for copying that the light should traverse these lines as much as possible, and never strike across them, which if allowed to do will produce a series of white marks, very much more conspicuous in the copy than in the original, and give a great deal of extra trouble in finishing. The direction of the lines being noticed, fix the plate again in its former position on the support and illuminate it *entirely* from the side towards which the lines run—it is generally most convenient to place them upright—all other light being cut off by black velvet screens.

Let it be borne in mind that in copying a Daguerreotype, it is actually copying a picture on a mirror that will reflect everything that happens to be in a position to be reflected like a mirror, therefore the utmost care should be exercised that only the black surface of the velvet screens are reflected into the lens, which will do no harm. If the lens is pointed *through* a tube (say a box with the ends removed) lined with black velvet, reaching within a few inches of the Daguerreotype, care also being taken to cover any bright parts of the wood or brass work of camera and lens also with black cloth or velvet, the conditions are about as suitable as they can be made.

If the Daguerreotype has been unfortunately bent, it must be straightened out as well as possible, having due regard to the delicacy of the surface, before commencing

operations; but, knowing the effect of curved reflecting surfaces, this precaution would of course be taken by the operator.

Sometimes these pictures are coloured by powder colours, applied with a soft camel-hair pencil; it is best to leave them as they are, for the colouring seems to make no difference—at any rate it has not with any that have come under my notice. Of course, if an exaggerated case of inartistic colouring is brought, the subduing effects of a soft brush may be an advantage.

There can be no special directions for development or exposure, as both depend on local conditions, and may be conducted in the usual manner. The Daguerreotype does not offer any special difficulties in either particular, although some give preference to the wet collodion process. See that the exposure is sufficient without veiling the shadows, and the development not too protracted, then the resulting negative will be found to print an excellent proof.

CHAPTER II.

The Wet Collodion Process—Photo-Mechanical Work—Expense—Clearness and Density—Negatives for Carbon Printing—Preparing Plates for the Collodion Process—Albumen Solution—Collodion—Effect of Impure Solvents of the Pyroxyline—Nitrate of Barytes as a Remedy—Boiling Down—Management of Nitrate Bath—Quality of Negatives—Improving the Negative by Pencil or Colour Wash—Development—Copying Line Subjects—Glycocine—Intensification—Strength of Light—Aperture of Lens—The Nitrate Bath—Sensitising the Plate—Draining the Plate—Form of Bath-Holders—Markings on the Sensitive Surface.

THE next process that claimed public attention, and with which modern photographers are conversant, is the collodion process invented by Scott Archer, and which

now occupies a position midway between the Daguerreotype and the gelatino-bromide dry plates, that have in a great measure superseded it. The collodion process is, however, far from moribund, and for certain qualities, as well as for convenience and cheapness, is equal, if not superior, to the gelatine plate. For photo-mechanical work, the ease with which density is acquired, and the clearness of the lines obtained, has not yet been exceeded or equalled by any dry process, and for the production of enlargements it remains very popular, especially when the enlarged negatives are intended for carbon printing, the absence of any yellowness in the film being a great recommendation. The ease with which a plate may be prepared, and in case of failure recoated and sensitised, is not one of the least advantages.

Plates before being collodionised should always, after careful cleaning, be coated with a weak solution of albumen, which will prevent the tendency of the film to slip off the plate during the after processes. The albumen solution for this purpose is made by well beating up the white of an egg to a froth, adding a pint of water with a little acetic acid, letting it stand about a day to settle, and filtering. The acid renders it much more limpid and more easily filtered than it otherwise would be. To albumenise, have the plates already thoroughly cleaned in a vessel of water conveniently placed, take out a plate, allow the water from the tap to run smartly over it, slightly drain, pour over a little of the diluted albumen as if varnishing, and let it run into the sink; now, with a fresh supply, again flood the plate, avoiding bubbles, and return to a spare vessel for future use. Then set the albumenised plates edgeways in a rack

to dry spontaneously, in a place free from dust. A number may be prepared at the same time, and when dry will, if they are kept carefully wrapped up, keep indefinitely, and be always ready for use, requiring nothing more than a dusting-brush passed over them before collodionising.

The collodion is generally purchased, although it is not difficult to prepare. A formula will be found at the end of this volume for those who choose to make the attempt. One thing may be noted of especial importance to obtain negatives free from defects, and that is the use of *pure* solvents for the pyroxyline. If the ether is acid, or the spirit impure, it will be almost impossible, after the bath has been in use a short time, to get rich, clean negatives, free from pinholes. The nitrate bath will rapidly deteriorate, and become practically worthless after having sensitised a comparatively few plates. Filtering will not remedy matters, as the formation of minute crystals is perpetually going on, and increascs with every plate that is sensitised. The addition of a little nitrate of barytes to the nitrate bath is a temporary improvement, as it precipitates the sulphates formed. This trouble is rarely found if the collodion is good and ordinary care is taken to prevent the introduction of foreign matter. Of course, after a time, organic and other matter will get into the bath in sufficient quantity to upset it, but with care and pure chemicals it remains good for a very long time, until from its supersaturation with ether and spirit from collodion, nothing less than boiling down will prove an effectual corrective. The proper management of the nitrate bath requires a considerable amount of expe-

rience, and it is generally found more profitable when a bath gets thoroughly out of order, to precipitate it, or boil it down and make a fresh one, than by any tampering and doctoring of the old solution.

In the wet collodion process, the chief idea is to obtain a rich warm-coloured negative, full of half tone, perfectly clear in the very deepest shadows, and opaque in the very highest lights; but a very small proportion of the image should possess these qualities, constituting as they do the extreme ends of its scale of density. It is very frequently found to be an improvement to add, by the pencil or brush, a few points of high light to the negative when development does not give them, and it is marvellous how a touch or two will apparently add to the scale of tones, and redeem a flat-looking negative. There are very many formulæ in use for development, but the one for which I have a decided preference contains albumen—albumen of itself, a neutral substance, apparently acting by virtue of its viscosity. The silver precipitated on, and forming the image in, its presence, has a richness of colour and velvety appearance that the addition of no other substance, of which I am aware, will produce (*see* formula).

In copying line subjects, the collodion process is eminently suitable; the addition of a little *glycocine*, formed by the action of sulphuric acid on gelatine, helps materially to procure density and clearness. A solution of this substance should be always at hand, where line work has to be done; a few drops added to the developer is all that is required. It possesses a very powerful restraining action on the rapidity of development, at the same time improving the quality

of the image. It is often necessary to supplement development by intensification when purely black and white negatives are required, so after the usual re-development with pyrogallol, acid silver, and washing, clear the lines by pouring over the plate a weak solution of iodine and re-immersion in the fixing bath, —this will remove any veil from the lines ; wash, and bleach the image in a solution of bichloride of mercury, followed by a weak bath of potassium cyanide, two or three grains to the ounce of water—the result will be absolute blackness of the dense parts and practically clear glass in the lights. This kind of intensification is quite unsuitable for subjects with half tone.

All black and white subjects should be copied in a rather weak light ; there is less irradiation with blocking of fine lines than if a strong light is used ; the lens should also be well stopped down. It is almost impossible to make a perfect copy of a line engraving if these precautions are neglected ; a full exposure, a weak light, and a lens well stopped down is an unvarying rule for this class of work, which in the two last particulars is the very opposite to that required for portraiture.

The nitrate bath is prepared in the same manner for all classes of work except *instantaneous*, when it should be always new and neutral—for other work slightly or very acid, according to the method of working. There is always a tendency in the nitrate bath to lose its acidity, especially if it is worked hard ; the addition of a drop or two of pure nitric acid occasionally is calculated to keep it in order.

It goes without saying that the chemicals used should be pure, and of the best quality ; the practice of 'any-

thing will do,' and rule of thumb, often so prevalent, is bound, sooner or later, to land the operator in all sorts of troubles that nothing short of beginning afresh with new materials will overcome. It is preferable to have two nitrate baths simultaneously in use ; the plate being almost sensitised in the first, should be removed from it and completed in the second ; by this means the surface is rendered less repellant to the developer, with much less chance of stains. The collodionised plate should be removed from the sensitising bath immediately the fluid flows off it in an unbroken wave, and it will be then in a more sensitive condition and remain more sensitive for a longer time than if left in longer.

A great point in the avoidance of stains is to well drain the plate before putting it into the dark slide ; for this reason horizontal baths are preferable to vertical or dipping ones. This form of bath (the horizontal) can be tilted so that the plate drains without drying, being surrounded by a moist atmosphere ; in working large plates this is a great advantage. Many faults and defects in negatives are induced by the exposure of imperfectly drained plates, notably the defect called 'oyster shell' markings, which are semi-opaque patches of reduced silver in the form of oyster shells, from which they take their name.

In certain atmospheric conditions, favoured by the state of the bath, the silver solution on the surface of the prepared plate gradually concentrates in strength by evaporation, and crystallises in patches, destroying the image wherever it does so. In hot weather, this is one of the most tantalising difficulties that occur in wet collodion work. Well draining the plate is the most effectual remedy.

CHAPTER III.

Keeping Plates Sensitive—Moist Plates—Glycerine and Silver Preservative—Time of Keeping—Preparing the Camera for Long Exposures—Glass Positives—Copying Glass Positives—Doctoring Old Positives—Positives into Negatives—Danger of Spoiling—Means of Safety.

THE great drawback attending wet collodion work is the necessity of using the plate within a short time of its preparation: by keeping, it not only loses sensitiveness but becomes defective in many ways; the best work is scarcely to be expected from a plate kept more than half an hour. Very many methods have been devised to prolong the time in which they can be kept in a good workable condition. The most simple is, after sensitising, to slightly wash in a bath of distilled water and re-dip in the nitrate bath *after exposure* and *before development;* this plan somewhat reduces the sensitiveness, but increases the time of keeping.

If a piece of thin plate glass, quite free from defects, is laid over the well-drained film—it having been *quickly* sensitised—merely separated by a strip of thin card at top and bottom, considerable increase in the time it will remain good is obtained. As the image has to pass through this cover glass—allowance must be made for its thickness in focussing—it will not be found to interfere with the definition in the least. A process was devised of coating the sensitised film with a mixture of honey, &c.; however, this was a messy, sticky proceeding, and sometimes caused fog and other defects, and never became very popular.

If to twenty ounces of a twenty-grain solution of silver nitrate in distilled water is added three ounces of glycerine and half an ounce of the best gum arabic, previously dissolved in part of the water, and the mixture set in the light for a week and then filtered, a very good preservative is made. On removal of the collodionised plate from the nitrate bath, it is transferred to a bath of this solution, in which it is moved about until it flows evenly off the surface; it is then drained and put in the dark slide, provided with blotting-paper along its lower edge to absorb any moisture that may drain off. Plates so treated will keep in a good sensitive condition many hours; they should be washed in distilled water, and afterwards re-dipped in the nitrate bath *before* development. The writer has kept plates so prepared half a day without detriment—and, in one case, a day and a night; but they suffered in sensitiveness, and were rather defective at the edges, by so doing. Still, fairly good negatives were made.

It may be considered proved that the best period of effectiveness in a wet plate is within half an hour of its preparation, and although its life may be lengthened by various means, it is always attended with a certain amount of risk from causes beyond the control of the photographer. An excellent plan to prevent the plate drying is to lay a piece of black cotton velvet, moistened with water, inside the camera during exposure, and also to place a moistened piece in contact with the back of the plate in the dark slide; this also tends to prevent halation, the pile side of the velvet being pressed well in contact with the glass.

The glass positive was the earliest application of the

wet collodion process, and, when skilfully done, made an extremely delicate and beautiful picture. The necessity for making a separate exposure for each picture limited its popularity, and now it is principally used by peripatetic and cheap workers. The process is identical with taking a negative, and consists of an extremely thin, somewhat under-exposed negative, the development being such that the picture is seen by reflected light, and the image very white and silvery. The finished positive is either coated on the back with black varnish or laid face down on black velvet, the black in either case forming the shadows, and the whole enclosed in a case or rim. Glass positives are excellent to copy from, being free from granularity, and, as a matter of course, make good enlargements. It goes without saying they should be copied from the film side for ordinary printing, and occasionally treated as transparencies.

It is rather dangerous to attempt the improvement of an old collodion positive. Sometimes we find them partially fixed, the iodide left showing whitish at the back; if refixing is attempted, the image will sometimes dissolve altogether, and leave nothing but bare glass. A well-exposed, or, I should rather say, an over-exposed positive may be changed into a negative by intensification with the ordinary pyro and silver; very great care is needed to prevent the film slipping off when wet, or splitting to pieces when dry. Supposing the intensification has been successful, after washing and before drying, flood it over with a thin clear solution of gum arabic, and let it dry spontaneously in a warm room. The plan of coating the developed and washed negative with gum solution is always advisable if much intensification has

been resorted to, especially if the sample of collodion used is of a very contractile nature.

CHAPTER IV.

Removing Part of the Image by Iodine and Cyanide of Potassium—Reversed Negatives—Cleaning Back of Plate—To Make Nitrate Bath—Instantaneous Work—State of Nitrate Bath—Mr. W. England's Opinion—Keeping the Bath Free from Floating Particles—Powdered Glass—Horizontal Bath-Holder—Advantages of Horizontal Bath.

IT sometimes happens that it is required to remove a portion of the image, either for the purpose of combining two negatives or removing a defective part. To do this, dissolve a drachm of cyanide of potassium in an ounce of water, and add a little iodine and a little gum arabic. If this solution is carefully applied with a camel-hair pencil to the part to be removed, it will speedily dissolve and leave clear glass; the negative must be well washed afterwards.

A wet collodion negative for carbon printing must be reversed, either by the aid of a prism, a mirror, or by exposing the back instead of the front of the sensitive plate; in the latter case the spring must be taken off the door of the dark slide and the plate kept in position either by pins or gummed paper at the corners. Of course these remarks do not apply to copying transparencies. The exposure will be the same as under ordinary circumstances. Care must be exercised that no dirt or defects are on the back of the glass; the pad of blotting-paper generally used to wipe off the back of the plate before placing on the dark slide had better give place to a moist pad of rag, so that no bits or fibres are left adhering, any of which would cause a defect on the

finished negative. As the nitrate bath plays a very important part in wet collodion work, the more simply it is made the better. Good water, but not necessarily distilled, is required. Take a half-gallon bottle—usually termed a 'Winchester Quart'—fill it up to the shoulder with ordinary drinking water, add five ounces of best silver nitrate, shake it till dissolved, and add twenty grains of carbonate of soda, which will produce a milky-looking solution; set this in the strongest light available for some days; the probability is it will soon become black and muddy—it all depends on the amount of organic matter in the water, the more organic matter the more mud—this will eventually settle at the bottom of the bottle, and then the solution may be filtered off into another bottle; to this filtrate add a few grains of iodide of potassium, shaking after each addition till a little of the iodide of silver formed remains undissolved, a drop or two of pure nitric acid is now added, and when it shows a slightly acid reaction to litmus paper the bath will be in a perfect condition for ordinary work.

For instantaneous work the very purest silver nitrate, free from all acid, is required, and the bath must be absolutely neutral when made, no preliminary iodising employed, as this bath is only at its best for this special work when it is quite new; after it has been used a short time it is past its best for instantaneous, but it will be perfectly good for ordinary work on the addition of a drop or two of nitric acid. This is the opinion of Mr W. England, one of the most successful producers of wet collodion instantaneous pictures.

In course of time the bath gets contaminated with bits of collodion films, &c., that settle to the bottom of

the holder when the bath is undisturbed, to be set floating about in the solution every time a plate is sensitised, and may sometimes attach themselves to the film and produce defects. To remedy this, place roughly powdered glass to the depth of about half an inch at the bottom of the bath; the foreign matter on settling will become entangled amongst the glass, and not liable to be stirred up by the dipper. The glass also acts as a safeguard from breakage in case the plate slips off the holder, or the dipper is put in too roughly. This is an excellent plan, and does away with the necessity of frequent filtering, keeping the bath bright and clear. When not in use the bath should be always carefully covered.

The horizontal bath-holder is worked with less solution than the vertical form, and, owing to the area of surface exposed, evaporation of the solvents of the pyroxyline is more rapid, which prevents the nitrate solution from becoming saturated with ether so soon as is the case with the vertical bath.

CHAPTER V.

The Collodio-Bromide Process—Its Special Use—Transparencies—Kind of Surface—Preparation of Plates—Storing Plates—Emulsion—Sensitiveness—Dust—Operating Room—Backing Plates—Halation.

AFTER the wet collodion we come to the collodio-bromide, a most excellent process where extreme rapidity is not required, but as experiments in this direction were in a great measure discontinued when the gelatino-bromide process was introduced in a workable and popular

form, we cannot say that its possibilities were by any means ascertained—in fact, by careful preparation, very great rapidity was obtained. For the preparation of transparencies it is difficult to beat, the image produced being luminous, clear, and delicate, especially lending itself to lantern slide work. All collodion plates except those of the collodio-albumen processes have unfortunately very easily damaged surfaces, which appear more so than they really are to those who have only been accustomed to handle the tough, hard, leathery gelatine films.

The collodio-bromide process recommends itself especially to amateurs, who can easily prepare over-night a stock of plates for the next morning's work with very little expense or trouble. The emulsion once being made, of which a stock can be kept for a long time without deterioration, there is nothing to do but coat clean plates and set them in rack to dry in a dark room (free from dust), which soon takes place, and the slides can be then filled in, or the plates stored away in light-tight grooved boxes. They will not bear packing together like gelatine plates, nor permit of their surfaces being in any way rubbed or touched without the greatest circumspection. As far as their use goes, it is immaterial whether they are thoroughly dry or not; they may be used as soon as set, and give perfect results.

A highly recommended formula, worked out by Mr. John Nesbit, is given for the preparation of the emulsion, and, from personal knowledge, the writer knows results absolutely perfect may be obtained from it. The sensitiveness is rather low, judging from the gelatine stand-

point, it being somewhat less than the average wet collodion ; but this is scarcely an objection for the purposes for which it is specially adapted.

In the preparation of all dry plates, absence of dust is very important ; every means to ensure this should be adopted, or the probability is the plates will be found on development covered with spots and defects. The very fact of moving about in a room, however quietly, will disturb any loose dust that may be present; special means should therefore be taken a few hours before coating the plates to get rid of as much of it as possible by passing a damp cloth over benches, shelves, and floor. It need scarcely be remarked that the less drapery and furniture there is in it the better ; a dusty room will be almost certain to spoil any plates prepared in it. If the room used is one devoted to photography, there is the chance of chemical as well as ordinary dust to be provided against. Dust is the greatest nuisance in all dry-plate processes, and the longer the plates take to dry the greater it becomes. When possible, a room void of everything except a shelf and table, with the walls and ceiling covered with varnished paper, and oil-cloth on the floor, well ventilated and safe from white light, should be provided for coating plates. Too great stress cannot be laid on this, as probably more failures are attributable to neglect of these precautions than anything else.

All dry plates are better for backing, and as the trouble is so trifling they should always be so prepared. A very good method of doing it is by brushing a thick cream, made of ground burnt sienna, in equal parts of methylated spirit and water with a little mucilage—the

addition of aurine or caramel is an improvement—over the backs, and letting them dry before packing ; it can be easily washed off under the tap before development ; if a little gets into the developer it does no harm. The more thinly the plates are coated with emulsion, and the more rapid they are, the greater the value of backing. If a rapid plate partly backed and partly unbacked is examined after exposure and development, on an ordinary subject with a fair amount of contrast, the advantage of the backing will be conspicuous ; a much greater clearness and brilliancy of the image will be perceptible in the backed portions. In interiors, woodland scenes, and portraiture, in which there is white or very light drapery to be dealt with, it is only by chance conditions that halation is avoided if this precaution is not taken ; it is *never* a detriment, and almost always an advantage.

Chapter VI.

The Gelatino-Bromide Process—Formula—Coating the Plate—Temperature—Coating-room—Continued Action of Weak Light—Drying—Packing—Backing—Testing—Variations—Development and Rapidity—Exposures—Improvement of Flat Negatives—Intensification—Mercuric Chloride—Washing Well Imperative—Cleaning Bath—Hydrochloric Acid—Perchloride of Iron—Effect of Iron on Intensification.

We now come to the exceedingly popular process of gelatino-bromide, which, since its introduction, has gradually been improved into a thoroughly reliable and most valuable means of negative-making, and is universally adopted ; in fact, to this process we may ascribe

the popularity of photography and the enormous increase in the number of those who practise it, either for pleasure or profit. A formula is given for those who wish to prepare their own plates, but as the price of really reliable ones is now so moderate, it is a question if it is worth the trouble and risk of making them at home. Those, however, who may wish to do so will have to observe certain methods and conditions that cannot be neglected without courting failure.

The emulsion being prepared, and the glass scrupulously cleaned and ready, a plate is taken up on the pneumatic holder, and a sufficiency of warm emulsion poured on, made to flow equally over the plate, the surplus drained off at one corner, the plate being slightly rocked to obtain an even coating; it is then, without loss of time, laid down on a *level* table—slate by preference—and, without further movement, allowed to set; as the room in which this operation is performed should not be at less than seventy-five degrees of heat, artificial means of cooling the slab on which they are laid to set is generally adopted; after setting, the coated plate is placed in a rack, in a current of dry air, to harden, which takes some hours, according to the hygroscopic condition of the atmosphere.

The less the plates are meddled with, after being racked until dry, the better. The drying should take place in *absolute darkness*, and the coating in as little non-actinic a light as possible. It must be recollected, although a light may be quite safe for a few minutes or longer, the exposure of plates for hours during drying is quite another matter, as light is accu-

mulative in its action, and *any* light at all long continued will affect the sensitive surface and cause fog. The sooner this operation is completed the better. Plates that have been an exceptionally long time drying are rarely so perfect as those more rapidly done. This is, perhaps, the greatest difficulty in preparing plates at home, and is often insuperable; all may go well until this part of the process, when the trouble taken may be, by unsuitable drying, rendered abortive.

The plates being thoroughly dry, it is a good plan to pack them face to face, a little piece of gummed paper on each edge binding the pairs together without any card or paper between them—the binding will prevent their rubbing, and although a little more trouble, absolute security is obtained; each four plates may then be smoothly wrapped in red or orange paper, and each dozen again in red paper and thin brown, and packed in boxes, to be each enveloped in good brown paper, and sealed up, with the date and kind of plate marked on them, the utmost care being taken to prevent any actinic light falling on them during the process: plates so packed will keep indefinitely. If it is anticipated that a long time will elapse before using them, an extra wrapping of waxed or paraffined paper is advisable, a warm knife being used to cement, as it were, the folds of the paraffined paper, and hermetically seal them, as far as possible, with a paper covering. In filling the slides, take the precaution to first remove any dust, which is a prolific source of pinholes, and slowly pass a camel-hair dusting brush over the surface of each plate before putting it in the holder. The plates can be backed after fastening them in pairs; the paint need

not be applied nearer to the edges than about half an inch; then there will be no danger of it running between them.

Always try one of each batch of plates to test its rapidity and general behaviour, for as the one is so will all the others be, and if they possess any peculiar characteristic it can be marked on the packet. It is curious that in making small lots, although the formula and process may be religiously observed, they will frequently vary very much in character. It is only where large quantities are made, and the whole process of manufacture reduced to a system, that uniformity can be fairly anticipated, and even with every advantage, uniformity is anything but an absolute certainty.

With increased rapidity we have increased difficulties in development in order to get bright, plucky images, full of detail. The more rapid the plate, generally speaking, the greater the tendency to flatness. Up to the present time few, if any, developers are better than pyro and ammonia, if the plate will stand ammonia without developing green fog. Excellent results may be, and often are obtained with other forms of developer, but, for my own part, I give the preference to ammonia as the alkali over all others. The image produced is more amenable to *after treatment* in case of over or under-exposure; an advantage not to be lost sight of, especially for work where some uncertainty exists as to the quality of the light and, consequently, of the correctness of exposures. In all cases of this kind the tentative method of developing should be adopted, beginning with a small quantity of alkali and gradually increasing

it, preferably to using the formula as it stands at first start; once get a little veil on the shadows before the necessary intensity is induced, as would be the case with a slightly over-exposed negative and full strength of developer, we either have to intensify afterwards or, by prolonging the first development, get a dense slow-printing negative, probably somewhat flat.

In case of over-exposed negatives with plenty of detail but deficient in pluck, much improvement may be effected by treating them after they have been fixed and dried with a bath of ferricyanide of potassium, five grains, and hyposulphite of soda, ten grains, to an ounce of water. Lay the negative in a white porcelain dish in this solution sufficiently long to render the deepest shadows tolerably clear and distinct, keeping the solution moving about all the time—this will take place in a minute or two; wash thoroughly and dry; then intensify to the required strength with bichloride of mercury, followed by cyanide of silver, as recommended by Dr. Monkhoven: many indifferent negatives may by this means be made as thoroughly good as if the processes of exposure and development had been right from the beginning. If only a little density is required, treating the dried negative with bichloride of mercury, followed by sulphite of soda, is a most excellent plan.

In all intensification processes with mercury, most thorough washing between the different applications is absolutely necessary to avoid stains and fading. Mercury has most undeservedly got into disrepute simply from neglect of this precaution. The perfect removal of one chemical when it remains free in the film before the application of another is obvious if we wish to avoid

stains ; and gelatine, unfortunately, on account of its slow and variable permeability, requires some time to free it from any soluble substance enclosed within its pores. The thicker and more insoluble the film, the longer the time required for properly washing ; this fact alone will account for many cases of failure, it being rather difficult to impress on beginners that one plate will require very much longer washing than another treated in the same manner.

Most negatives are improved by a bath of alum *slightly* acidified with citric acid after fixing, not sufficient acid to effect much reduction of density, but enough to just clear the shadows. If moderate lowering of density is required, dilute hydrochloric acid will be better than anything. If *much* reduction is wanted, perchloride of iron solution, followed by hyposulphite of soda, will effect it, even to the absolute destruction of the image. In using this plan for the first time there is considerable risk of overdoing it, as the change in density does not become very noticeable until after the application of the hyposulphite, so the best plan is to give the plate a dip for a few seconds in a dilute solution of the perchloride, take it out, give it a wash, and treat it with the hypo ; if sufficient reduction has not taken place, repeat the process—it will soon be found how long is necessary. This is an effective and excellent plan, properly done, and one in great favour with many photographers. All negatives that have been treated with iron, either as in ferrous oxalate development or with sulphate of iron in the hyposulphite solution, as recommended by Mr. B. J. Edwards, seem more easily intensified than negatives not so treated ; on this account I have found it an advantage to put the

negative in a bath of sulphate of iron (ten grains to the ounce of water) for five minutes before proceeding to intensify with mercury, of course washing off the iron solution before the mercury bath is used.

CHAPTER VII.

Photographing Interiors—Character of Negatives—Development of Negatives—Eikonogen and Rodinal—Backed Plates—Backings—Suitable Plates—Screening off High Lights—Direction of Light—Reversal, Blurring, and Halation—Reduction of Halation—Exposures—Point of View—Composition—Avoidance of Exaggerated Perspective—Straight Lines of Arrangement to be Avoided—Crowding—White Drapery—Ordinary and Special Arrangement—Proportions—Shading the Lens—Securing the Tripod.

INTERIOR work—that is, any work carried on in enclosed spaces, where the illumination is considerably less than in outdoor work, and the contrast of light and shade very much greater, such as church interiors, rooms, caverns, and so forth—requires the negatives to be rather different in character to those taken in the open air; generally speaking we prefer slow development, such as effected by a normal developer, so far as the *proportions* of its constituents are concerned, but diluted to half its strength with water. This is to avoid getting too great density in the high lights before the detail is sufficiently brought out in the shadows. Detail should always be the chief aim in the development of an 'interior' negative. Once get the detail, there will be no difficulty in getting printing intensity. 'Eikonogen' is excellent for this class of work, but better still is 'Rodinal,' a one-solution developer lately

introduced by Dr. Andresen, which seems, as far as I have tried it, to be all that can be desired for work of this kind ; it brings out detail in the shadows without over-intensifying the lights, and is well under control. Once make yourself master of the required conditions, then almost any developer can be made to produce satisfactory work, some of course with more facility than others, depending on the skill of the user.

Plates for this work are always better backed by some of the popular methods. The writer has found burnt sienna, ground and made into a thick cream with methylated spirit and water, to which a little gum has been added together with a little caramel or aurine, excellent for the purpose. Black varnish—asphalt in turpentine—is also effective, but somewhat troublesome to remove. Aurine dissolved in collodion is also a neat method, but in coating the back of the plates with this care must be taken not to get the coloured collodion on to the film side of the plate.

The best kind of plates for any interior work are those containing a fair amount of iodide in addition to the bromide salts, and a rather slow plate should be selected. If there is a flood of light directly in front of the camera—often the case in church interiors—it is simply impossible to get a good result with a very rapid or even a moderately rapid plate containing no iodide. Halation will hopelessly spoil the picture in spite of any backing. There are means of screening such windows during exposure from having their full action on the plate, as for instance, a mask of some opaque material suspended a short distance in front of the lens by means of a wire support attached to the lens mount,

or even by painting on the front lens itself with some opaque colour just where the image is seen reflected on the surface. But both plans are very troublesome to carry out; and, when equally good results, or even better, may be had by using suitable plates properly backed, it is scarcely worth while to incur it. When it unfortunately happens that the plates are unfitted for the purpose and have to be used, these plans will be found about the best that can be adopted. Whenever possible, always avoid any strong light in front of the camera.

In addition to halation, there also takes place a reversal of the image, with much over-exposure, which is undoubtedly one of the most annoying results found in interior work, and for which there is, so far as I am aware, no remedy. The negative may be absolutely perfect in every other respect, but the window frame and landscape outside show as well-defined positives or small bright windows show as clear glass instead of being opaque. This reversal generally includes the portions nearest to the light, as the stonework surrounding and the framing and leading of windows. Very rapid plates invariably give this trouble. The exposure for the window being probably a fraction of a second, and that for the interior itself half an hour or more, it is only what might be expected.

In developing such negatives it will be found that the light has not only penetrated through the film to the back, but has been *laterally* dispersed in the film itself, there being besides a certain amount of halation from reflection, no matter how the plates are backed. Good work is hopeless on such plates. If we use slower plates,

containing iodide, reversal is seldom induced, except in exceptionally trying cases, and blurring may be got rid of by abrading the surface of the dried negative with a soft pad and methylated spirit, so that no signs of it remain in the completed work. With the rapid bromide plates such rubbing down is of little or no avail; the image being impressed pretty equally through the film from front to back, the only result is a thinning of the image without the removal of the halation, consequently there is a flat unsatisfactory look about the picture that no dodging can properly remove.

Unless the interior is exceptionally well lighted, a long exposure is a safe principle to go on. It is quite possible to get a very good result from an over-exposed interior, say twice as long as necessary, but from an under-exposed one only failure would result with the most careful and scientific development possible. In setting to work to photograph the interior of a room, thorough success depends on the artistic capabilities of the worker quite as much as on his plates and outfit. In the first place he should well consider the possibilities of the room and from what point it is best lighted; then place the camera in position, and proceed to arrange the furniture, ornaments, &c., so that they shall compose well; anything too near the camera should be moved on one side or further away, so that, with the wide angle lenses usually employed, there is as little of that apparent enlargement and distortion as possible. Avoid placing the articles so that one is directly above another in the picture. We will suppose a straight-legged table, a vase, with a bookcase in the background, or the frame of a door or picture. Let the things be so placed that

no straight line is formed from floor to ceiling by the leading lines of the different articles, which give an unpleasant appearance to the photograph. Make it a rule to avoid *continuous* straight lines in *any* direction whatever except of the architecture. They almost always can be avoided with a little judgment and trouble that should never be thought unnecessary, even when the simplest things have to be dealt with.

Avoid giving the appearance of crowded furniture, which suggests the sale-room rather than the dwelling; much better underdo it in this respect than overdo it. Do not arrange the furniture formally, but try and convey the appearance of recent occupation. A book partly open on a table, some article dropped on the floor, a picture set on a chair, and a score of other little touches will suggest themselves as conducive to this effect. White drapery, antimacassars, and such things are much better removed, the idea being to get harmony and avoid spottiness. Perspective views of most things are preferable to direct front ones. Chairs, tables, couches, &c., must be moved to do this; a very little alteration will often make all the difference between a good view and a bad one. Nothing is too insignificant to be neglected, and an hour spent in well arranging a room is never thrown away. Putting the camera down and taking things as they happen to be, although the arrangement may be sufficiently satisfactory in an ordinary way, will not do for photography unless by a rare chance, which seldom comes. There should be less space on that portion of the picture devoted to the ceiling than the floor.

In many instances the light is so poor that it is

almost impossible to see much of the image on the focussing screen. A lighted taper moved by an assistant into different parts of the room will aid in focussing and determining the amount of view included. It is essential to clearness of image that no strong side light be allowed to fall on the lens during exposure, and so cause reflections from the mount. It is best to extemporise a hood if there is not one already attached to the camera, by placing any sufficiently light article on the top of the camera, a thin book for example, to project over the lens, and over which the focussing cloth can be thrown.

On slippery floors, such as marble, tiles, or polished wood, there may be some difficulty in keeping the tripod from slipping unless special means to do so are adopted. A piece of cork fixed on the points of each leg is about the best plan to extemporise, or a piece of string with a running knot fastened round outside the legs under any projection that will prevent the string slipping upwards; small holes drilled through the legs, and through which the end can be passed, is a very good plan, and answers every purpose in a neat manner. Sometimes screw-eyes are fixed in the legs for this purpose, but any projection is more or less inconvenient in packing; holes drilled through answer every purpose.

Chapter VIII.

Artificial Light—Magnesium—Flash Lights—Diffusion—Relief in Effect—Mirrors—Smoke—Condition of Magnesium—Quantity Required—Lamps—Blitzpulver—Position of Light—Precautions Against Fog—Colour—Orthochromatic Plates.

Artificial light is now very frequently used for illuminating dark interiors, and also as an aid to daylight. Magnesium, in some form or other, is generally preferred. When used as a *flash* light there is a great chance of getting false and inartistic effects unless it is well diffused, or several lights are used simultaneously; also great care bestowed in their arrangement. If there are windows in the sides of the room that will not come into the picture, the artificial light should be fixed somewhere in their vicinity, two on one side of the room and one on the other, with one or two over the camera, according to circumstances; if the apartment is a long one, lights should be placed at about equal distances down its length, care always being taken to shield them from the lens. Although it is quite proper to have a light above or behind the camera, the *principal* light should be always from the side; unless it is, there will be a decided want of relief in the picture, that adds so much to the beauty of an interior. Precautions, also, should be taken that no reflections from mirrors interfere with the picture. The camera, &c., reflected in a large mirror is anything but satisfactory; of course this applies to working by daylight almost as much as by artificial light, but it is less likely to be noticed when flash-light pictures are attempted until too late for remedy.

Great care should be taken to make the *first* exposure a success, as the smoke of the magnesium takes some time to clear off, and is fatal to good work if it exists. Some lamps are well known to make much more smoke than others; a little magnesium, *perfectly dry* and thoroughly ignited, will give more light and much less smoke than a much larger quantity incompletely burnt. The rule should be to use as little magnesium as possible. As soon as it is seen to be scattered about unburnt after the flash, it is a certain sign that very much less than the possible amount of light has been obtained from it, and much more used than necessary. There are numerous lamps in the market, but I prefer one having a very large spirit flame, through which the magnesium is blown in an upward direction, as the light is generally brighter and the combustion more perfect than when the magnesium is blown across the flame. Too great stress cannot be laid on the necessity of thoroughly drying the magnesium *shortly before use*, and the better it is kept from contact with the air from the time it is made the brighter it will burn. By exposure to moist air a slight coating of oxide forms on the surface, which interferes considerably with rapid ignition.

The admixture of any salt that will easily part with its oxygen to the magnesium, such as potassium (chlorate), should not be made until just before use, not only on account of safety, for such mixtures form very dangerously explosive compounds (blitzpulver), but the quality of the light is somewhat better. In taking portraits with the flash light good results may be obtained with one lamp, providing a number of reflecting surfaces have been judiciously arranged and the light kept far

enough away from the sitter. The fault generally observed in portraiture is an unpleasant look in the eyes, with an expression anything but flattering, caused by the sudden glare of light placed too near the sitter a screen of tracing paper before the light will diffuse it and make the results very much more satisfactory. In all cases where the flash light is used, the light itself must not be allowed to shine into the lens—this, of course, applies to any kind of artificial light; if this precaution is neglected the result will be fogged negatives. Where there are installations of gas, electric light, or flash lamps, there is less chance of defects than when a light is carried about in the hand and fired off at some supposed propitious moment; the chances are that the effect on the lens is forgotten in the anxiety of getting effect on the sitter. When working in confined situations it is very important that the smoke of the magnesium be carried off either by ventilators or boxes constructed for the purpose, that is, if more than one exposure is needed. A cloth should be thrown over the camera as a precaution against the light penetrating any tiny hole, or crevice, in the apparatus; that, with a less concentrated light, might produce no ill effect.

Almost all pictures taken by artificial light are more harmonious when the subjects themselves are light in colour. There seems to be no advantage in the use of colour sensitive plates for this kind of work unless the illuminant is yellowish; in fact, where magnesium is used. I have obtained better results with ordinary plates, both in respect of sensitiveness and production of detail in the shadowed portions than with orthochromatic. There is this to be said, orthochromatic plates

vary very much in quality, and those tried might have been deficient in sensitiveness, for theoretically they should be sensitive as ordinary ones in a white light.

CHAPTER IX.

Outdoor Work—Necessary Knowledge of Art Principles—Difference Between Studio and Outdoor Negatives—Lighting—Perspective—Wide Angle Lenses—Narrow Angle Lenses—Preparations to be Made—Position of Camera—Proportions of View—Effect of Clouds—Position of Figures—Suitability of Figures—Water—Unsuitable Subjects—The Stereoscope—Exposure—Securing Clouds—Proper Use of Cloud Negatives.

OUTDOOR work, to which so many amateurs now devote themselves, is, perhaps, of all kinds of photography the most easily mastered; for success really depends more on artistic ability than the processes used. A proper comprehension of the beautiful, with a sound knowledge of the laws of composition, are the main requirements. Many quite capable of making unexceptionally good negatives, technically speaking, fail in producing good pictures, simply because their artistic perceptions are either untrained, deficient, or absolutely wanting. It is only by chance really good pictures are produced by those who cannot appreciate or understand the rules of art that apply to the work they set themselves to do. A true artist will produce a picture out of materials that would present nothing to an ordinary observer worth the trouble of an exposure. The photograph may be faulty, but the *picture* will be there; and now that manipulations are reduced to such a simple form,

providing one has the artistic ability, there should be little or no difficulty in producing good work. A good open-air negative differs from one produced in the studio by being somewhat denser and brighter, that is the contrasts are greater; in other respects, rules proper for one are proper for the other.

It is impossible to give any definite directions for making a landscape picture. The lighting is, of course, important, and, as a rule, a light from one side and a little behind the camera gives the best results; and the worst is when the sun is directly behind the camera. Morning and towards evening are the best times of the day for artistic effect, as then the shadows are longer and more effective. At midday shadows are dwarfed, and there is much more probability of the picture being spotty in effect, with a deficiency of relief in its various planes. Aerial perspective is quite as important as linear perspective in a good photographic landscape, if not more so. Perspective may be rendered quite truly, and yet not be artistic.

One of the greatest failings in work produced by wide angle lenses is the undue exaggeration of near subjects and the awkward-looking angles given by the upper parts of high buildings when photographed at close quarters. A good rule to go by is always to use the most *narrow* angle lens that will give the necessary amount of subject. Getting as much as possible on a plate is wrong in principle and wrong in practice, unless under very exceptional circumstances.

Before photographing a view, let it be carefully examined as to its best points and most suitable lighting

taking especial notice of the composition of the foreground, which, in the finished work, will generally be the most noticeable part of the picture. The real height of the horizon depends, of course, on the height of the point from which it is viewed when the camera is quite level, and is usually fixed at about two-thirds of the height of the picture, seldom exactly in the middle. By elevating or depressing the camera the horizon can be raised or lowered. The fault in many otherwise good photographs is *too much* foreground, which is painfully apparent when such pictures are enlarged. If *good clouds* are introduced, the width of the foreground may be considerably reduced by lowering the horizon line, the clouds affording the necessary compensation.

If the landscape should show a blank space for sky, clouds are easily added, and if judiciously chosen, with regard to form and perspective, the picture is wonderfully improved; in fact, few photographic landscapes with a space for sky can be considered perfect without clouds.

Whenever possible, include figures of some kind, but see that they fall in the proper places to compose well with the landscape. A single figure in modern fashionable attire set in the middle of a view would irretrievably spoil it. It is a common practice in lane scenery to fix a man, like a post, right in the middle of the road, probably looking at the camera. If he is to be included in the view, arrange him somewhat at the side; however, a single figure rarely composes satisfactorily, especially if only supplied with a walking-stick or umbrella. Rustics and agricultural implements are rarely out of place, and will often add much to the interest of the subject but

as the composition of the picture depends entirely on the artistic ability of the operator, it is impossible to do more than hint at certain shortcomings and possibilities that will possibly present themselves.

Water is one of the most valuable accessories in landscape work. A very ordinary view may frequently be made most interesting by the skilful management of water; if it has a slight, oily ripple on its surface its picturesqueness is greatly enhanced. An *absolutely still* sheet of water is not so easy to deal with, the mere reflection of its surroundings is somewhat disappointing in the print, although, I believe, it is looked upon by some as the 'ne plus ultra' of beauty. The only kind of picture in which an absolutely still surface becomes pleasant to look upon, is in the stereoscope, and in this kind of picture is has a fascination utterly absent in all other kinds of photographs. Woodland dells, and similar views are not particularly suitable for ordinary photography, as they generally have a flat spotty effect, but for stereoscopic work they are some of the best subjects possible; no other kind of photography is able to give anything like the realistic effect and separate the different distances in such pictures like the stereoscope, the interest in which, so long dormant, fortunately seems now to be reviving.

In all outdoor pictures expose for the shadows; it is only in *rare instances* that by so doing the distance or the light parts will be overdone, but if insufficient exposure is given to the shadows the very fact of trying to force out detail will to a certainty make the lights too intense. In case of distance with dark foreground, after sufficiently developing the sky, wash the negative and

continue the development of the ground with a soft brush, the negative being held upright and frequently washed to soften off the more developed portion into the other. If it is desirable to secure very good cloud effect, existing at the same moment with trees or buildings projecting into them, the best method of procedure is to make two negatives from the same standpoint, and give a proper exposure for each subject, and print them together afterwards. Very perfect results may be made in this manner, with a minimum of trouble. All landscape photographers should have a good selection of cloud negatives on *considerably larger plates* than that upon which the landscape is taken; the extra size permits their adjustment with better effect and less appearance of repetition. To see half-a-dozen different landscapes with the same clouds, in the same position, is essentially absurd, especially if they are exhibited together at the same time.

CHAPTER X.

Cloud Negatives—Development of Cloud Negatives—Kinds of Clouds—Application of Clouds—Treatment—Density—Varnishing—Defects—Suitable Plates—Artificial Clouds—Tinting Down—Necessity for Suitable Clouds.

CLOUD negatives are easily made, providing a clear unobstructed view of the horizon can be obtained. The seaside offers great facilities for this class of work, although clouds taken there are somewhat different in character to those taken from more inland stations. In taking a cloud negative, a small stop should be used

and a *moderately* quick exposure given; if facing the sun, the sun itself should be hidden behind clouds, or the probability is there will be an objectionable patch of light surrounding it that will quite destroy the usefulness of the negative. The development should be rather slow, using a dilute developer well restrained. The idea is to get a *thin* negative with *good contrast.* A strong, dense cloud negative is practically useless for printing in clouds to other pictures. A print lying under a suitable cloud negative is discernible through the densest portions and will be sufficiently printed in a silver print in ten minutes or less in a good diffused light. The most useful clouds are generally to be found a little to one side of the sun, when their edges will be nicely illuminated. Clouds taken directly overhead are little or no use, no matter what their contour may be; the perspective of such clouds, it is easily understood, could never be correct for any landscape. Cloud negatives once obtained may be reduced or enlarged in the camera to make them suitable for various sized pictures, and can, of course, be copied from either side, adding to the variety. Cumulus clouds taken on the side away from or opposite to the sun are extremely useful, especially where wide spaces of sky have to be filled in; they are generally of a quieter character and more evenly illuminated than those nearer the source of light. There is a tendency to neglect this description of cloud in favour of those with great contrasts, certainly at the expense of truth and harmony.

Unless clouds are taken *for themselves*, and the landscape is intended to hold quite a secondary position, the less obtrusive they are the better. The top-heavy

appearance of deeply-printed clouds, frequently burying some of the landscape itself, is one of the greatest mistakes that can be perpetrated. Views so treated are always spoiled. Whenever a deeply-printed sky is desired, the landscape must be lighted and printed to correspond. In nature, however dark the shadow in the clouds may be, they are *very much* lighter than those of the ground, as very little observation will testify. Therefore, to make the clouds equal in depth of colour to any portion of the earth is not only contrary to truth and common sense, but an eyesore to anyone with cultivated taste. It is for this reason cloud negatives are made thin and quick printing, greater delicacy being thus more easily secured. A *strong* cloud negative is almost sure to print the shadows too deeply by the time the detail is sufficiently printed in the light portions. If we print such a negative with reference to the shadows, the lights will be bald and deficient in detail, a spotty, crude effect being produced the reverse of pleasing.

Cloud negatives should always be varnished, as the wear and tear is considerably more than with ordinary negatives. A very few scratches will utterly ruin the most beautiful *cliché*. The least imperfections in a sky are directly observable, in fact, challenge attention, and there is no means of passing them off as part of the surroundings, as is the case with other parts of the picture. A cloud negative must therefore be an *absolutely perfect* one, and the plates chosen to take them on by preference slow and containing iodide. The rapid bromide films rarely give good results for this work, or at any rate as good as the slower kinds, besides being

much more difficult to develop. With a suitable plate and a proper exposure cloud negatives are quite as easy to manipulate as any other kind, and all landscape photographers should make a point of securing a good assortment when opportunities occur.

In cases where natural cloud negatives are not available, artificial ones are preferable to none. Some, indeed, would be difficult to distinguish from real ones. Clouds may also be painted on the backs of the negatives with opaque colour or tracing-paper attached and clouds painted on this. In almost all devices of the kind a slight tinting or sunning down is necessary in addition, after printing, to harmonise the whole and obtain the best results, and it is surprising how a little judicious toning down will improve a crude cloud effect. Cotton wool is sometimes used as a substitute for clouds, but is not to be commended. I most emphatically recommend, whenever possible, to use natural cloud negatives, in preference to anything else, but clouds of a form *suitable to the subject.* Natural clouds become unnatural if they are placed in an impossible relation to the view, and the advantages attached to their use are consequently neutralised. We have instead caricature clouds as absurd in their way as any other kind of caricature, and in an otherwise good picture, quite as much to be deprecated.

CHAPTER XI.

Portraiture—True and False Portraits—Kind of Negative Required—Exposure—Objection to Strong Side Light—Use of Subdued Light—Blinds—Reflectors—Manner of Operator—Height of Camera—Treatment of Sitters—Hands—Lighting the Sitter—Proofs.

PORTRAITURE is a branch of photography entirely distinct from any other, and depends more on the man than the process. The intention is, or ought to be, to secure the most characteristic likeness possible of the sitter. The operator must be quick to seize any peculiar trait or expression and turn it to the best advantage. In the present day so much is conceded to vanity that a portrait is not a representation of the person, but is rather an ideal of the retoucher. As such it is really not at all photographic, and it is a libel on photography to call half the portraits one sees "photographic" for this reason, although we thoughtlessly accept them as such.

The kind of negative required is a thin one in comparison with a landscape negative, bright and full of detail. The quality of the negative is in a great measure dependent on the management of the lighting, round, brilliant pictures being aimed at. In this work rapid plates are generally preferred, the time of exposure being reduced to the smallest possible quantity; in dealing with children a fraction of a second is frequently all that it is possible to give, and in that time a fully-exposed picture is required.

Of course, the lenses used are of a different character to those for landscape work, having very wide openings in proportion to their length of focus, *f*-8 being the

size of the diaphragm usually employed, *f*-4 or *f*-6 for especially quick work.

A strong side light seldom gives pleasant results, unless it is counterbalanced by corresponding top and front lights; as without a fair proportion of front light the texture of the skin is harshly rendered. Again, too much front light gives a flat picture. Skill in lighting must be acquired by practice, and a thorough knowledge of the effects of light and shade.

When there is very much white or very light-coloured drapery, the light used should be very subdued, with just a touch of stronger light to give effect to folds. Portraits taken much in shadow, with such drapery, are most effective. A strong light, such as would be used for dark clothing, would, with white clothing, cause flatness, and probably halation, with little or no detail, a flat white patch, inartistic and bad from every point of view. The proper and artistic rendering of white drapery is always considered a severe test of manipulative skill, and as it frequently occurs in conjunction with dark complexions, to do justice to both face and figure requires the exercise of great discrimination in both lighting arrangement and development.

The blinds of the portrait studio are generally arranged to suit the shape of the lights, and also the fancy of the operator. A series of somewhat narrow blinds, covering the whole of the roof when drawn together, working from each end of the studio, when both ends are used, is a very convenient plan, as it permits the operator to be in front of his sitter, and to watch the effect of alterations during their movement upon him or her, as the case may be.

Several adjustable white reflectors form part of the working paraphernalia. For rules of grouping, the student should consult some work on this especial subject, but in all cases, natural or acquired artistic ability is a *sine quâ non.*

Decision in posing, freedom from fussiness, and a pleasant manner, are important qualities in the operator, these, combined with imperturbable good temper under trying circumstances, go a long way towards securing successful portraits.

The height of the camera has a good deal to do with the view of the face, whether the lens looks down upon it or up to it. About the height of the chest is a good average height. If the camera is pointed downwards it shortens the neck and raises the shoulders; if pointed upwards, it has the contrary effect.

Very stout people are generally best taken somewhat in profile, a full face is seldom flattering, a fairly strong side light being used. Thin people are better taken more front view, and with a much reduced side light. The hands are, perhaps, more difficult to pose than any part of the body. In the first place, well-shaped hands are not the rule, and, secondly, there is considerable, difficulty in getting the sitter to retain any unaccustomed position in which you may place the hands. If they are decidedly awkward and ill shaped, hide them as much as possible by something held in them or by the folds of the dress. Avoid all stiff and formal poses. and try, to the best of your ability, by pleasant conversation, to remove that self-consciousness that so frequently asserts itself as soon as absolute stillness is required.

Avoid double or false lights on the eye, often produced by improper placing of the reflectors. Never seem in a hurry, as though you were anxious to get rid of your sitters, but with pleasant, prompt courtesy get rid of them from the glass-room as soon as the operations are completed.

Always deliver the proofs as soon as practicable, for there is more chance of good orders when promptly executed than when much delay takes place.

CHAPTER XII.

Copying — Suitable Rooms — Copying Tables — Easels — Working — Black and White Productions—Oil Paintings—Preparation of Oil Paintings for Copying—Developing—Avoidance of Reflection—Orthochromatic Plates—Manuscripts or Discoloured Paper—Bromide Prints—Matching Originals—Copying Works of Art—Backgrounds—Lighting—Ornamental Glass—Silver Plate—Placing Articles to be Copied—Flowers—Accessories—Stained Glass—Transparencies—How to Copy Transparencies—Daylight—Gaslight—Masking—Balancing Exposure.

COPYING is often a very important part of a photographer's business, and, if possible, a room should be expressly devoted to this purpose. The makeshift arrangements many photographers have for copying, militate very much against the production of the best work. For copying, the common stand should be of the table form, easily raised or lowered, and the top constructed to readily alter the level of the camera ; the whole should run on rails, backwards and forwards, towards an easel running on the same rails, so that the camera and easel are always at right angles with each

other, there will then be no difficulty in getting the lens central with the picture to be copied. Where there is no contrivance of the sort, a great deal of time is wasted in securing the proper adjustments. A little too much to one side or the other, will throw the picture out of square, and the difficulty of getting it exactly true, without some method of this sort, can scarcely be realised until tried. When drawings have to be taken in sections, the time occupied in merely focussing without such aid can scarcely be believed by those who have not attempted it, but, given this mechanical adjustment, a few minutes is all that is necessary.

Copying black-and-white drawings is tolerably easy work. Use a small stop, a slow plate, and a moderate but even illumination, give a fair exposure, not too short, or there will be considerable difficulty in getting the requisite intensity, use a well-restrained developer, rather weak, and do not hurry the development.

With oil paintings, the first care is to avoid reflections; use a strong top light, and little or no front light, and expose for the most non-actinic parts of the picture, sometimes full sunshine is necessary. Just before beginning to copy, sponge over the picture with a little glycerine and water or old ale, this will considerably brighten up the subject, if it is irregularly sunk in, or the shadows are very dark, and the details in them difficult to make out. The copying must take place during the time the surface remains moist. When the work is completed, sponge off with a little clean water, and dry with a soft rag. Sometimes a little oil, carefully applied, will be all that is necessary. The state of the surface and condition of the picture must be care-

fully examined before doing *anything* to it. A rather strong developer is indicated in this case, such that would be suitable for portraiture. The greatest difficulty with oil paintings, new or old, is copying them free from reflections. The keys at the corners of the stretchers should be tightened, and when the picture is fixed, carefully examine it from *the point the lens sees it.*

It is useless beginning an exposure hoping that slight reflections will not show; they always do, and look worse in the negative than they do on the screen. The ridges caused by the paint, brush marks, and so forth, are apt to catch the light when other reflections seem to have been got rid of, and, if overlooked, the negative will seem to be splashed over with points of light very detrimental to the finished picture.

In copying paintings, let them be illuminated, as nearly as possible, with light from the same direction they were painted in. This will often get rid of considerable trouble in the matter of reflections, very little, or no front light, is permissible; this should be guarded against by hanging up black cloths, a short distance in front of the picture, over the camera, and the removal of any light or bright objects lying about. Orthochromatic plates, with a screen, are far and away the best for this kind of work, especially if brilliant colours have to be copied. With pictures consisting of grey or neutral tints, ordinary plates will answer perfectly, and give very little trouble; in fact, for such pictures I prefer a good ordinary plate to the orthochromatic ones.

Manuscripts of faint lettering, on yellowish paper, are better reproduced by orthochromatic plates than

ordinary ones, using a pale yellow screen, in fact, any pictures in which yellow colour predominates, give better results with the orthochromatic plates.

Negatives of drawings, documents, and similar things, with very little contrast, are best printed by the Bromide process. If a very faded document, or a lead pencil drawing on toned paper, has to be made the best of, it is a good plan to, first, make a negative by the orthochromatic process, then from this a bright print on bromide paper, and, finally, copy this, the resulting negative will give plenty of contrast, and be as good as if the originals were not faded or pale. Of course, in the printing afterwards any depth of colour may be made, and the paper tinted to match the originals.

Caramel diluted is an excellent tint for imitating the colour of old manuscripts; coffee is sometimes used, but is not quite so good. A skilfully made copy on paper, whose surface is something like the original, is a wonderfully close imitation, and if folds are actually made in the copy corresponding with the original, it adds considerably to the illusion. In copying works of art, a background should be chosen making a good photographic contrast in colour with the objects to be copied. A good and generally useful background is a smooth sheet of brown paper; sometimes a curtain will be more appropriate, but whatever it is it should be suited to the particular work in hand.

The materials being arranged according to taste, see that the light falls on them so as to produce the best effect. The exposure and development call for no particular remark, so that the negative is soft and brilliant.

The treatment of glass positives and Daguerreotypes was dealt with in the first chapter.

Ornamental glass, such as jugs, cups, &c., are best photographed in a rather weak light, and with a moderately dark background. Polished silver goods are somewhat troublesome; filling them with ice and water causes a deposition of moisture on the surface, that facilitates the work. The surface may also be carefully covered with a thin film of whiting and water, or milk, by means of a spray diffuser—this is, perhaps, the most really useful plan; a very thin coating will be sufficient and the article must be most carefully handled after application before the copy is made, or ugly patches will be left. The insides of painted or chased bowls are best taken slightly in perspective; this is also the best position for most solid articles that have to be photographed. Flowers indicate the use of orthochromatic plates and a good diffused light; the negatives of flowers should be similar in character to portrait negatives—rather thin, bright, and full of detail; the addition of a little drapery, bass matting, or ornamental woodwork, &c., will assist, by contrast, to enhance the delicate curves and texture of the flowers.

Stained glass is best copied by using *transmitted* and *reflected* light *simultaneously;* also orthochromatic plates are indicated with the kind of screen suitable to the most important leading colours and designs in them. If crimson or ruby predominate, probably ordinary plates will give more satisfactory results than the colour sensitive ones.

Copying transparencies, if in the camera, is plain sailing; the even illumination of the transparency being

the principal thing. The conditions required for success are a good strong light and a reflector, consisting of a large piece of white cardboard, placed at an angle of forty-five degrees—with regard to the transparency, *all* light being cut off from the lens except that passing through the transparency to *form the image.* To effect this an opaque mask should be placed on *the transparency*, and a tunnel extemporised by laths and black cloths between the transparency and the camera.

If plain glass or any open space is left by the side of the transparency, there will, in all probability, be lack of brilliancy at the edges of the picture, caused by the encroachment of the stronger and unobstructed light ; this *especially* applies to copying by contact and artificial light, as, unless a mask is used in such cases, it is almost impossible to get a perfect result. If a transparency is more dense at one end than the other, a piece of dark paper kept gently moving over a corresponding part of the reflecting cardboard may be made to exactly balance the light ; any dark part of the transparency can be made to receive extra exposure in this manner, or any thin part less.

Chapter XIII.

Winter Scenery and Snow—Exposure—Development—Contrast—Advantage of Sunshine—Moisture on Lens—Camera Hood—Attention to Apparatus—Waterproof Cloth.

Snow and winter scenery is very charming in a photograph, and offers no particular difficulties to the photographer. Snow or hoar-frost scenes in a good light

require very short exposure, and a development similar to that adopted for white drapery in the studio. In these subjects we have to deal with small contrasts of light and shade—especially so in hoar-frost pictures, the aim should be to get quite as much, perhaps slightly more, contrast in the negative. In snow scenes somewhat more attention is required to the shadows and those portions not covered with the wintry mantle; much, however, depends on the amount of snow; providing nothing more than tree stems and branches show uncovered, they may remain a neglected quantity, and the development and exposure be precisely the same as for hoar-frost. If possible, a bright sunshine should illuminate the view, as this increases the contrasts and wonderfully brightens up the picture. It is a great advantage to any snow scene to have some dark object near the foreground, to give effect, by violent contrast, to the white surroundings; it also breaks up the monotony of an evenly-covered snowy landscape.

A precaution to be taken in winter outdoor work is to occasionally examine the lens, inside and out, and see that there is no moisture condensed upon it. In all cases in which the lens is suddenly taken into extremes of temperature or moisture, this examination should be repeatedly made. A very slight deposit of moisture on the glass will produce foggy negatives, and if this matter is unnoticed at the time the fault will probably be attributed to something else, as no signs of the cause may be detectable if the apparatus is examined afterwards at home. In all subjects in which there is an excess of light a projecting hood to the lens will be found of great service; in snow scenes especially the lens

should be guarded from reflections from below as well as above by a light, cone-shaped, wire framework, covered with black silk or velvet.

It may be looked upon as an *invariable* rule that any light not forming the image is always detrimental to the brilliancy of the picture, not only in winter scenes but in all others; of course the whiter or brighter the surroundings the greater the necessity for this precaution. The familiar dodge of holding the hat to shade the lens should be made unnecessary by some such contrivance as that alluded to. Any one who has experienced the advantages of a proper lens shade would never think of working without, unless compelled—the quality of the negative is so much improved in every respect as to be equivalent to better plates and more skilful development. After a winter excursion it is advisable to see that the apparatus is dry before putting away; bits of snow and ice are very apt to adhere to it and be enclosed with it, to the detriment of both wood and leather. A small waterproof sheet will be found very convenient to protect camera or slides from contact with the wet ground, and also to throw over them in the event of a downfall of snow or rain.

CHAPTER XIV.

Printing—Wilful Neglect of Instructions—Silver Printing—Ready Sensitised Paper—Temperature of Solutions—Blisters—Preparation of Sensitised Paper—Condition of Albumen Paper—Bubbles in Sensitising—Drying—Preservation of Ordinary Sensitised Paper—Preservative Bath—Keeping Sensitising Baths Uniform in Strength—Acid Baths—Neutralisation—Depth of Printing—Toning—Quality of Paper—Colour—Fixing—Washing, Hot-Pressing, and Ironing—Treatment of Sensitising Baths—Platinotype—Precautions against Yellowness—Bromide Prints—Testing for Sensitiveness—Development—Temperature of Water.

PRINTING on platinotype, bromide, gelatino-chloride, kallitype, carbon, or silver, have each, with the exception of silver, such concise directions issued with the paper-supplies that it will be superfluous to do more than allude to them in these chapters; but in spite of all directions, explicit as they may be, failures will occur, usually from a wilful neglect of them or sheer carelessness. There are numerous operators who will persist in making what they think improvements in a process they have had little experience with, and also neglecting to scrupulously adhere to directions, because they, to them, seem quite unimportant; it need not be said this is the principal class who so frequently report failures. There are others who, after the most flagrant violation of instructions, think or say they follow them exactly. Silver printing is a process taken liberties with, perhaps, as much as any; it will, fortunately, stand a good deal of abuse and yet give good results.

Ready-sensitised paper is used by most photographers more or less, and when of good quality is often a saving of valuable time. I do not think it can be termed absolutely reliable, and certainly some is thoroughly bad.

When albumenised paper is used in large quantities it is generally sensitised at home, and not prepared to keep for a *long* time; if it will remain without deterioration for a week or ten days, it is as long as needful. In the treatment of ready-sensitised paper, after the prints have passed one or two washing waters, they should lie a short time in a bath made weakly alkaline by carbonate of soda, and then have another wash or two of clean water before toning.

A warm and weak toning bath generally suits this sort of paper best, whatever the composition of the toning solution may be. If given to blister put the print *dry* from the printing frames into methylated spirit for a short time, then continue the processes of washing, toning, and fixing, as usual—Richmond's plan. So-called home-sensitised paper is prepared as follows:—The paper should lie for a few days before sensitising in a cool, slightly damp place, to get into a flaccid condition; it is then floated, albumen side down, on a bath, consisting of sixty grains of silver nitrate to an ounce of distilled water for three or four minutes until the paper lies flat, care being taken that no air-bubbles are between the paper and the solution. If the back of the paper is carefully examined, the position of bubbles will be readily detected, and the sheet must be raised by one corner and the bubble removed with a glass rod. A neglected bubble means an insensitive patch on the paper when printed.

When the paper is removed from the sensitising bath, it should be held by two corners and drawn slowly over a glass rod fixed to and over the end of the dish, to remove the surface moisture; the sheet can then be

hung over rods to dry, or blotted off between sheets of bibulous paper, and dried by being suspended to lines by American clips. When dry, they are laid face down, one on the other, and stored between boards till required for use.

Without any further preparation, if this paper is laid alternately with sheets of blotting-paper that have been dipped into a strong solution of carbonate of soda, and dried and placed under pressure, the keeping power is greatly augmented ; or, as an alternative, after sensitising as directed and drawing over the rod, float it again for a minute or two on a bath containing silver nitrate thirty grains, citric acid thirty grains, gelatine two grains, water one ounce ; draw over a rod and hang up to dry. Such paper will keep perfectly well for some weeks, print quickly, and tone readily in any good toning bath. It must be borne in mind the first sensitising baths must invariably be *plain silver nitrate and water*. A strong solution of silver nitrate of one hundred grains to the ounce of water, should be kept at hand, and two drachms of this solution added to the bath for every sheet of paper sensitised, in order to keep it up to the normal strength.

Sometimes the albumen paper contains acid in itself and gradually imparts it to the sensitising bath ; this necessitates testing the bath with litmus before use, and if found acid, neutralising with a few drops of liquor ammonia.

Now comes the printing, which should be rather darker than the prints are intended to remain. The exact depth of colour depends a good deal on the negative and the light it is printed in, and which experience will determine. Wash as with ready-sensitised

paper, and tone until the prints are the right colour by gaslight, and put them in a tray of clean water until ready for fixing. The colour very much depends on the paper irrespective of the toning bath used. Some kinds of paper dry up *very much* blacker than others. Allowance must be made for this in toning.

The fixing bath consists of a solution of hyposulphite of soda, one part to four or five of water; this should be made fresh, each time it is used, by dissolving the hypo in hot water and adding cold to make up the proper quantity, with about ten drops of liq. ammonia added to each pint of solution. Immerse the prints singly in this, and keep them turned over and over for a quarter of an hour or twenty minutes; then remove them singly and wash in several changes of water to remove the principal part of the fixing solution from them quickly as possible, occasionally squeezing them on a glass plate to drive the solution from the pores of the paper. They may then be put to wash for an hour or two in water kept gently agitated by any mechanical means that may be available. The temperature of the water should not be less than 65 or 70, and there is no objection to it being considerably warmer.

The prints are now taken out and dried between sheets of blotting-paper or calico, to be mounted, &c., as may be desired. Large quantities are dried by being hung up by their corners back to back by American clips to frames to drain and dry. If intended for sale without being mounted the prints are hot-pressed, which increases the brilliance of the surface and gives them a finished appearance. For small quantities, ironing them on a sheet of close-textured felt, *on their backs*, with a hot

flat-iron, is a considerable improvement, and in a measure stops that tendency to curl that all albumen paper has.

Sensitising baths should be kept clean, either by subsidence or filtering; they will remain colourless if kept in the dark with a little carbonate of silver at the bottom of the bottle. After pouring out into a dish for use, the surface should be skimmed with a strip of paper to remove any scum that may be there, and which otherwise would adhere to the first sheet or two of paper floated and cause defects. When the sensitising is completed, return the solution to the bottle, add sufficient strong silver solution to restore the normal strength, give it a shake up, and set aside in the dark until required for the next sensitising.

In platinotype printing, if the directions issued are strictly followed, little more need be said. However, we often see platinotype somewhat yellow, owing to carelessness in the matter of washing after development. Never omit the *three* acid baths. The rule is—out of the developer into No. 1 for five minutes, out of No. 1 into No. 2 for 10 minutes, and from No. 2 into No. 3 for twenty minutes, changing the first when discoloured; a good wash after, and there is little fear of the prints going yellow. As to the time of printing, an actinometer as used for carbon work will be found very useful.

In bromide printing and enlargements try a small piece of paper for exposure and development before proceeding to make the larger copies. Ferrous oxalate is generally used, although hydrokinone is a very excellent developer. The proportion of one of iron to five or six of oxalate is a good average proportion, but

formulæ issued by the makers of the paper are good as any and ought to be better.

In all gelatine printing processes cold water must be used, as a very moderate degree of heat will make them very slimy and easily damaged. It is impossible to say anything about length of exposure of any value, as that must depend on the negative and the light. It will be soon seen in developing if the exposure was right; the muddy effect of overdoing it, and the black and white results of under-exposure explain themselves, but if a small test piece is tried there should not be much difficulty in this respect.

CHAPTER XV.

Carbon Printing—The Tissue—Sensitising—Transparencies—Printing—Safe Edge—Reversed Negatives—Enlarged Portraits—Drying the Tissue—Actinometers—Development—Depth of Printing—Continuating Action of Light—Difficulties—Notes on the Process—Double Transfer Process.

CARBON printing is more of a mechanical than a chemical method, very simple, and producing charming results. The tissue may be had plain or sensitised and of different colours. A carbon transparency is by far the best kind for the reproduction of negatives, and second to none for lantern work. The chief difficulties lie in drying the tissue and judging the exposure. When only a few prints are wanted, it is best to buy the tissue ready sensitised, as, if *kept dry*, it will remain good for some time. The negative to be printed should have an opaque margin, which will act as a "safe edge" during development. The negatives themselves must be re-

versed unless the double transfer process is adopted. Very few thoroughly succeed with the double transfer, simple as it seems, and preference is nearly always given to the use of reversed negatives. Carbon printing is extensively used for the production of enlarged portraits. A transparency having to be made it is quite as easy to copy the original one way as the other. If it is proposed to sensitise the tissue, a bath of five per cent. for winter and ten per cent. for summer of bichromate of potash, made neutral with liq. ammonia, is prepared, in which the tissue is *immersed* for a short time, until it becomes limp ; it is then taken out, laid face down on a slab of collodionised glass, and much of the moisture removed from the paper by means of a squeegee, the paper being protected by a piece of waterproof cloth laid over it. The tissue adhering to the glass is then placed in the dark to dry, in a room through which a warm current of pure, dry air passes. The fumes of coke and gas are prejudicial. In about six or eight hours the tissue should be dry and ready to strip and cut up into pieces of convenient size for use.

The exposure being determined by means of an actinometer, a small instrument containing a strip of sensitised paper passing below a small aperture which admits the light to the paper, and when this has been tinted to a depth corresponding to a tint painted on the box, it is called one tint ; the paper is then shifted and again allowed to darken ; each darkening is termed a tint, an exposure is so many tints. An experimental exposure is first made, and the number of tints for that exposure recorded. If correct, the number is marked on the negative, and, for the future, the same number of

tints will, of course, produce the same quality of prints in ordinary good daylight (in yellowish light this is not quite accurate) with that same make of tissue.

The exposure being made, the print is laid in a dish of cold water, until the curl inwards is changed to a tendency to curl in the opposite direction. A piece of perfectly clean glass is then placed in the water, and the wet carbon tissue laid face down on it, and both are raised out of it together, care being taken that no air-bubbles are enclosed between the glass and the tissue. A stroke or two of the squeegee, from the centre towards the sides will remove much of the water, it is then laid down with a few pieces of paper and another piece of glass over it, to get partially dry. In twenty minutes or so it will be ready for development. A good supply of warm and hot water being at hand, the glass on which the tissue has been attached is laid in water at about 90 or 100 degrees of heat, glass side downwards. As soon as the colour begins to exude from the edges of the paper, it is taken by one corner and gently stripped off the glass, leaving the coloured gelatine behind. Holding the glass in one hand, the warm water is dashed over the surface until the image shows up distinct and clearly, and no crapy lines or muddiness is left, it is then placed in a 5 per cent. solution of alum and water a short time, swilled with clean water, and set up edgewise to dry. Care must be exercised not to rub the soft wet image, as it is easily damaged, but when dry it is safe, and the transparency is completed.

If the picture is too dark from over printing, a plentiful application of hot water will somewhat reduce

it, but if it is too pale, the printing has been insufficient, and the process must be repeated. Under-printed proofs left for some hours in a slightly damp air will continue to print, although not exposed to the light. This fact is taken advantage of in printing large quantities of work, a greater number of proofs from one negative being thus obtainable.

Sometimes the tissue refuses to strip and will not adhere to the glass; in such case it has probably become insoluble, either by age, or has taken too long to dry after being sensitised.

If ammonia is added to the bichromate solution sufficient to change it bright yellow, it will increase the keeping qualities of the tissue, but make it print more slowly. One part of the ammonia added to ten parts of bichromate makes the gelatine more easily soluble. Sometimes the prints become a little cloudy in the alum bath, which may be prevented by the addition of one drop of sulphuric acid to each pint of solution. Acid in the developing water retards the development, but adds brilliancy and clearness. Strong bichromate sensitising baths cause the picture to develop softer, weak baths have a contrary effect. Squeegeeing with too great pressure or irregularity destroys half tone in places. Fingering the surface of the tissue will cause spots of unequal sensitiveness.

Too strong or too warm bichromate bath will cause reticulation of the film. Too slow drying causes irregular sensitiveness, and too quick a liability to tear or crack, but quick drying causes more easy development, and the film adheres well to the support. If the development takes place too soon after squeegeeing on to

the glass, there is a liability to granular and net-like surface, by separating the paper too soon, and it being attached slightly in places, causes irregularity by more or less absorption of water; in a large picture one half may differ from the other in intensity, and it is difficult, if not impossible, to overcome this unevenness by development. Want of half tone may be induced by squeegeeing too hard. Too weak or too old a bichromate bath, or the tissue too rapidly dried, are both likely to interfere with the proper development of half tone. In the double transfer process, the tissue, instead of being squeegeed on the glass, is attached to a waterproof flexible support, and from this transferred in a similar manner to the permanent support. For more detailed information of this beautiful process, consult the manual issued by the Autotype Company, who supply all the requisite materials, and have practically a monopoly of the work

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CHAPTER XVI.

Matt Surface Paper—Drawing Paper—Preparation—Blue Prints—Preparation of Paper—Printing.

MATT surface paper may be easily made at home from any of the photographic papers now in the market.

Whatman's drawing paper has acquired a popularity as suitable for rough surface prints; the greatest objection to its use is the unequal absorption of the solutions used to prepare it. The following process will give a very good matt surfaced paper, that will print

and tone satisfactorily. In the first place, dip the paper into a bath of methylated spirit in which five grains of yellow resin to the ounce have been dissolved, the paper is then dried and ready for the subsequent treatment. A solution of five grains of hard gelatine is made in an ounce of water, adding two grains of citrate of soda and ten of ammonium chloride. Now soak the resinised paper in this and dry; the paper so salted may be kept indefinitely. To sensitise for use, float until the paper lies flat, or brush over the surface (the paper being pinned to a drawing-board) a solution of silver nitrate, 90 grains, in an ounce of distilled water, to which has been added sufficient liq. ammonia to just dissolve the precipitate caused by its addition, then add ten minims of strong acetic acid and filter.

In case of brushing the sensitising bath over the surface, Buckle's brush is the best instrument to use. Set the drawing-board at a slope, first brushing the solution from end to end, then across, so that it is as evenly applied as possible, then hang up to dry.

This paper will not keep very long, but gives nice bright prints. With some samples of paper, it is necessary, after drying, to go again over it with the silver. Any paper of tolerably even substance may be prepared in like manner. If it is required tinted, a little aniline dye can be added to the salting bath.

Another plan is to use plain paper not resinised, and *brush* over the surface with a cream of arrowroot in which ten grains of chloride of ammonium and five of chloride of sodium to the ounce have been dissolved. Dry and sensitise as in the first instructions; this makes a very nice looking print.

Blue or ferro-prussiate printing, is an inexpensive and easy way of making photographs, as the development requires nothing more than a dish of water, and is useful if one desires to see the effect of a negative when away from home. To make the paper, or rather to prepare it, two solutions are necessary, to be mixed together just before use; the formula for which will be found in the part devoted to formulæ. The prints should be exposed to the light, as in silver printing, till the details are well out and the image assumes a greenish-grey colour, then removed from the frame and plunged into a dish of plain cold water, when the image will rapidly become clear and blue. After washing in a few changes of water the print can be dried.

CHAPTER XVII.

Lantern Slides—Suitable Plates—Day and Artificial Light—Quality—Colour of Transparencies—Developers—Colouring Carbon Transparencies—Mounting—Matts—Shapes Suited to Subjects—Size of Slides—Definition of Image—Transparencies for Copying—Transparencies for Decoration.

TRANSPARENCIES for lantern slides are, and have been now for some time, extremely popular, and making them affords a pleasant occupation for winter evenings, beautiful results being readily obtained by almost any dry plate process. Some few processes require daylight, owing to the comparative slowness of the films used. The best of these requiring daylight are the carbon and the collodio-bromide. By artificial light excellent results are secured on ordinary slow gelatine-bromide plates, or on lantern plates especially prepared for the

purpose. There is no great difference in the manipulations from ordinary work. The special qualities that all good lantern slides must possess are that they shall have thin, bright images, perfectly clear in the highest lights, and a pleasant colour. Any veil, however slight, interferes with their proper exhibition, and although excellent as transparencies, to be viewed as such they are, so to say, useless for lantern exhibition. It goes without saying that the exposure must be tolerably well timed.

When artificial light is used, the right exposure once obtained is easily repeated; a certain time to a paraffin lamp, or so many inches of magnesium burnt, ensures similar results time after time. Transparencies are either made in the camera, or by direct contact. When large pictures have to be reduced to lantern size, the camera is used, and contact printing when pictures the same size as the original negatives are required. Prints by contact are more quickly made than those in the camera; a few seconds to a gas flame if ordinary plates are used, or a few inches of magnesium ribbon with plates of a slower kind.

The time of exposure, to a certain degree, determines the colour of the transparency—a long exposure with a somewhat restrained development produces warm tones, a short exposure and energetic development colder ones. The addition of a little clear albumen solution to the developer has a modifying effect on the colour, and very pleasant tints may be obtained. Colours also differ according to the character of the developer used. Ferrous oxalate gives a warm grey, but is perhaps the most seldom used of any; soda tends to warm colours;

hydrokinone, to cold; pyro and ammonia, both warm and cold; eikonogen, cold; rodinal, rather cold; the caustic alkalis also tend rather to cold than warm colours; uranium has also a tendency to coldness. Collodio-bromide plates may be toned with gold, black, or grey; and carbon prints are of course produced of the same colour; the tissue is made, generally, a purple brown.

Transparencies in carbon are easily coloured to any tint by the application of aniline dyes, either wholly by immersion in a dilute bath of the dye, or partially by aid of a camel-hair pencil. In mounting a lantern-slide the shape of the matt should be suited to the picture. The idea of filling up the whole of a circular disc on the screen ought by this time to be exploded; but whatever shape is chosen, it should be absolutely true at the edges and symmetrical in form; nothing looks worse at a lantern show than ragged edges, a lop-sided shape, or one unsuited to the subject. Lantern masks are now supplied in such various forms that there should be no difficulty in selecting a suitable one.

Good instantaneous views of shipping and clouds are about the only subjects that look well in any shaped opening; architectural subjects are seldom seen to advantage in circular ones. The size of the lantern-slide must not exceed three and a quarter inches in width, but there is practically no restriction as to length, although the popular size is three and a quarter inches square. Panoramic views, ten or twelve inches long, are very effective in the lantern.

It need not be said that when the amplification is so great as it is on a large screen, the transparency must be *perfectly* sharp, nearly so is not good enough,

absolutely perfect definition is imperative, and freedom from defects of all kinds is the *sine quâ non* of a good lantern slide. Transparencies for copying, and reproduction of all kinds differ from those for lantern work, in being more exposed and somewhat stronger in character. They must be *full of detail* and *not very dense.* Most lantern transparencies, if used for copying, would produce harsh and crude results, unsatisfactory in the extreme, so, to overcome this hardness, a longer exposure is given, and a modified developer is used. Transparencies for decorative purposes differ from either of the foregoing in being much stronger in the shadows and possessing more contrast in all respects; they are usually mounted in contact with ground glass, or something equivalent to it, in order to be seen to advantage when hung up.

Chapter XVIII.

Stereoscopic Work; its Decline and Revival—Lenses Used—Table—Even Films—Equalising Density—Adjustment of Lenses—Size of Picture—Printing—Transparencies—Levelling Camera—Base Line—Trimming—Masking—Preparing the Negative—Copying Camera.

Stereoscopic work is one of the most beautiful applications of photography, although for some years past it has been, so to say, lying dormant; but, of late, signs of revival have been manifested. It is difficult to say why it ever lost its once exceeding popularity with any degree of certainty, but inferior stereoscopes and the trash placed on the market as stereoscopic views no doubt had their

influence. Stereoscopic negatives are usually taken in a camera with twin lenses of the same aperture and focus, although one lens may be made to answer the purpose. Stereoscopic pictures were first made by the use of an ordinary camera and lens on two separate plates, the apparatus being fixed on a Latimer-Clarke table, which worked similarly to the action of a parallel ruler; this was found troublesome, and the camera was then divided by a screen into two portions, the lens being mounted to move laterally on the camera front. The picture being taken first on one half of the plate and then on the other.

For still objects this plan answers very well; but if moving objects have to be depicted, it is imperative that two lenses should be used and worked simultaneously, otherwise the photography is precisely the same kind as to exposure and development as for other pictures. It is important that each end of the plate is of the same density; should there be any difference in this respect from varying thickness of the film, and if it cannot be equalised by chemical means, matt varnish or tracing paper must be put over the back of the thinnest half to effect it. The distance the lenses are separated determines the stereoscopic effect, if they are too far apart it produces an unreal, exaggerated appearance of the foreground, and being too near together a loss of stereoscopic relief. About three inches is the usual distance from centre to centre of the lenses. It is a curious thing that although the two pictures must not be wider than three or three and a half inches for moderately near objects, there is no limit, in reason, to their height. The more *distant* the object to be photographed the greater the

amount of separation permissible in the lenses, which any one knowing the principles of stereoscopy will easily appreciate. Lenses of about six inches focus are most suitable for general work.

Two methods are used in printing stereoscopic prints —for it must be borne in mind that in mounting, the position of the two prints must be reversed, that is, the left hand picture must be placed on the right hand side of the mount—the first method is to print the double negative in the ordinary manner and trim the prints afterwards, and the other to use a strip of paper twice the length of the negative, and to double each end of the strip back to meet in the centre, then to print the folded paper on both sides and divide in the middle afterwards.

Glass stereoscopic transparencies are of all photographic pictures the most delicate and beautiful, and may be made either by direct contact printing, for which a special printing frame is made, or by copying in the camera with twin lenses. The same remarks apply to these transparencies as to transparencies for enlarging, that they must be well exposed and brilliant, and not too dense. Their colour is a matter of taste, on the whole a warm black is as suitable as any. They are finished by mounting in the same manner as lantern slides, but in contact with a piece of very fine ground glass or its equivalent, and binding the edges.

In mounting paper stereoscopic pictures, care must be taken to mount them true with respect to each other, so that the images will properly coalesce in the stereoscope without any special effort of the eyesight. The accuracy of adjustment must not be overlooked in the

negative, by adjusting the camera perfectly level and having lenses the same height. It is not so much in pointing the camera up or down, as it is in having it level from *side* to *side*. If this is not attended to, each picture will have a sloping base line which gives considerable trouble afterwards.

In trimming stereoscopic pictures, supposing all the conditions required for taking the negative were carefully fulfilled, it is necessary in the first place to form a perfectly straight and horizontal base line on both pictures which is readily done. If some object in the foreground is selected, say a stone, leaf, or any other conspicuous object that appears in both halves, a straight edge is laid from one to the other, and a line is cut which forms the base line of the pictures. This regulates the rest of the trimming. Place the gauge on the left hand picture and cut it out; in cutting the right-hand picture, leave a *little* more of the right side of it than on the left-hand picture. Unless this precaution is taken, the mount will appear *further* away than the subject it encloses when examined in the stereoscope, an effect it is just as well to avoid, as we wish to see the picture through the frame, and not in front of it.

If the negative is masked, or painted round of the proper dimensions before it is printed, much trouble is saved in trimming. It is better to mask or paint a little space between the pictures than to let them touch each other; it is not absolutely necessary, but the effect is better. Sometimes the double negative is cut in two, fixed on another piece of glass, and then masked, the two halves being transposed. Of course, in this case the pictures are *not* cut apart for mounting. Unless

these precautions are taken, the effect in the stereoscope will be what is termed pseudoscopic, or reversed in perspective.

Mr. John Nesbit, a clever amateur, and who has made stereoscopic work a speciality, made a copying camera, by which the uncut negative could be readily copied, the position of the pictures being properly reversed. Two lenses were used, easily separated, or brought nearer together by a milled-headed screw, acting simultaneously on both lenses. The frame holding the negative was adjustable in any direction, and the negative properly masked. The distances between the lens and the negative, and the lens and the sensitive plate, being also adjustable by this means, larger or smaller pictures could be made with a minimum of trouble.

CHAPTER XIX.

Enamelling—Method of Working—Preparation of Gelatine—Spotting—Opaline Pictures—Mounting—Mountants—Prints Stretching Unequally.

ENAMELLING, a process extensively used by some firms to impart a glossy surface to the print, is produced in the following manner:—

A sheet of glass, free from scratches or unevenness, is waxed over by scribbling over the surface of the glass with a piece of white wax, and warming it before the fire till the wax melts, then rubbing the wax off with a soft rag free from fluff, this constitutes the waxing. The glass is now coated with enamel collodion, and when well set, washed under a tap until the greasiness disappears. The prints

already trimmed are placed in a hot solution of gelatine, laid face down on the washed collodion surface, carefully avoiding bubbles, and gently squeegeed down, then left to dry. If the point of a penknife is inserted under one corner, they will easily strip off the glass, or becoming *very* dry they will probably peel off unassisted, but care must be taken not to attempt their removal until they are quite dry, or dull marks will be produced on the surface. The strength of the gelatine solution, is one ounce of gelatine to half a pint of water.

The whole process should be conducted in a warm room, and precautions adopted to keep the gelatine solution fluid, by having all the vessels and glass well warmed. There must be no bits of foreign matter in the gelatine solution, which should be carefully strained, and dust avoided during the whole of the process. In spotting the prints, the colour should be mixed with a little white of egg, and then dipped into spirits of wine to render the albumen insoluble, before enamelling, as no spotting can satisfactorily be done afterwards ; they are finally attached by their edges to their mounts with strong gum water.

Opaline pictures are nothing more than prints cemented in optical contact by means of hot gelatine solution to bevelled plate glass. The glass being cleaned, a number of prints properly trimmed, are immersed in the hot gelatine, taken out one by one, squeegeed on to the glass and left to dry, the glass not being waxed or collodionised, retains them firmly afterwards, as in enamelling. Care must be taken to avoid air bubbles between the glass and the print.

Mounting photographs is usually done with fresh

starch paste. The damp prints are laid face down in a heap on a piece of glass, and the top one of the heap brushed well over with the paste, lifted by its corners, and laid down on its mount accurately with regard to margin. When a few are done in this fashion, a sheet of clean paper is laid over them, and even pressure applied by the hand or mounting roller. When the mounted prints are dry, they are rubbed over with a rag previously rubbed on a piece of hard white soap, and then put through the burnisher. The dry soap is superior to the soap solution used before burnishing.

In mounting large quantities of large pictures, a somewhat different method is used. A large lithographic stone is made warm, and this is brushed over with thin glue. The print is then laid down on the glued stone, and the hand lightly pressed over it; it is then lifted from the stone retaining sufficient glue to attach it firmly to its mount, on which it is laid, without stretching the paper or cockling the mount.

To prevent stretching of the paper and distortion of the image in portrait work, the prints should be pasted with starch and allowed to dry, the mounts then damped, and the dry starched prints laid on the damped mounts and passed through a press together, the adhesion will be good and no stretching take place.

A solution of white shellac in spirit is an excellent mountant for gelatino-chloride prints. The solution should be made about the thickness of cream and lightly painted round the edges of the prints. This is not suitable for albumen prints.

Chapter XX.

Photo-micrography — Apparatus — Exposure — Precautions.

Photo-micrography. — The simple and concise directions published by Mr. T. Charters White, M.R.C.S., embody as much information in a small compass as it is very well possible to convey. The chief point is the simplicity of the apparatus used, and the excellence of the results. Of course, the outfit may be more elaborate, and the different movements more refined with advantage to the experienced worker, but by following his directions a photo-micrograph may be produced of excellent quality by the amateur or those who do not feel inclined to invest in expensive apparatus. His advice is to begin at any rate by using low power objectives, only having the field of view limited by the size of the plate, and working with ease and comfort. The method is for photographing transparent objects, and not opaque ones. He thus describes his apparatus :—

An oblong lidless box, laid on its side and screwed to one end of a base-board, two inches thick and two and a half feet in length, the upper central part of the base-board is about an inch thick, is made to slide in a dovetailed groove, at the end of which is an arrangement for holding the sensitive plates to be contained in an ordinary printing frame, which may be of any size required according to the degree of amplification required. An oblong opening is cut in the upper side of the box, to which a tin chimney is fixed, so that the lamp may be moved nearer or farther away from the object stage without obstruction. Another opening is made in the box facing the plate-holder, and central

with it, which can be closed by a movable brass plate having an adapter with the standard microscopical screw soldered into it. Below the plate, a support carrying the movable stage is fixed to the side of the box, the stage being moved backward and forward by a long micrometer screw for focussing roughly. The fine focussing to be arrived at by other means, another plate is put into the holder, having fine lines drawn on it by a writing diamond, to face the objective, the image is examined through the back with an ordinary focussing magnifier, when the details of the image are sharply defined at the same time as the ruled lines, the focussing is complete. The glass is removed, and a sensitive plate inserted in its place. The lamp is a microscopical lamp burning the purest paraffin oil, in which a little camphor has been dissolved; a condenser concentrates the light on the object. An opaque screen is used to cut off any useless light.

A black curtain falls over the open side of the box, protecting the plate from the light, and a shutter covers the lens till the plate is ready for exposure. The *modus operandi* is as follows:—Light the lamp a short time before use to warm up the apparatus and prevent expansion which would cause a blurred image; adjust your microscopical slide to be enlarged, and throw the image on the focussing screen, a piece of glass covered with white paper, and examine it carefully in order to judge the exposure. As a help in this he recommends the study of a paper by Mr. Walmsley, an American optician, which was published in THE BRITISH JOURNAL OF PHOTOGRAPHY in 1885. An approximate exposure would be, with an inch and a half objective, three to forty-

five seconds, and with $\frac{1}{10}$ inch objective, four to ten minutes. Now, shut off all actinic light, and by the light of a safe lamp place the sensitive plate in position; make the exposure, shut off the light again and develop. It is very important there should be no vibration caused by persons moving about or otherwise, or the probability is the enlargement will be blurred. It is important to get the light central with the object glass, which can be ascertained by looking through the optical portion, and seeing the image of the light in the centre of it.

CHAPTER XXI.

Development — Green Fog — Pyro-Ammonia — Over-Exposure — Under-Exposure — Eikonogen — Density — Hard Films — Carbonate of Soda — Rodinal — Intensification Methods — Reducing — Perchloride of Iron — Ferridcyanide of Potassium — Precautions to be taken.

DEVELOPMENT.—'Many men, many minds' one may say with regard to this, and I would certainly advise any one who is thoroughly master of one kind, if it is a good one, to stick to it. There are more badly developed negatives made by shifting from one formula to another than from almost any other cause. For my own part I prefer the old-fashioned pyro and ammonia for ordinary work for several reasons. You may always depend on getting a *good* printing image, other things being correctly done, and the negative is more easily manipulated afterwards with respect to reduction and intensification, especially reduction, than with most other kinds of developers. Formerly some plates of foreign make would not stand ammonia without the production of green fog, but I believe now that other forms of develop-

ment than ferrous oxolate, which at one time was almost universal on the Continent, having now come into use, the plates have been modified to correspond.

I do not know of any English make of plate that ammonia and pyro, properly used, will not develop satisfactorily.

Supposing we have to develop an unknown exposure, we must proceed in a tentative fashion, beginning by flooding the plate with the pyro and bromide alone, *never* wetting the plate first with water as sometimes recommended, as with me this invariably gives trouble with air bells. Put a drop or two of ammonia into the developing cup, pour off the solution from the plate to it, and return it to the developing dish, it will soon be seen if the plate has received an excessive exposure; in that case add more pyro, and continue the development with the small quantity of ammonia. If no image appears in a minute or two, add a little more ammonia, say half the normal quantity, if still the image seems reluctant to appear, add the whole of the ammonia, and have patience. Now, if there is evident signs of *much* under-exposure, dilute a fresh quantity of the normal developer with an equal quantity of water, and continue until the image is properly out; if, after a reasonable time, the detail refuses to come up, *wash the plate well*, and continue the development with eikonogen; then if this will not bring up a satisfactory image, which it probably will not, the negative may be considered bad. If it is your own, the best thing is to put it with the waste, and take another, but if some one else's, it must be taken care of and properly washed, fixed, and made the best of.

With plates covered fairly thick with good emulsion, the development should be complete in two or three minutes. When the high lights appear at the back of the plate the development may be considered ended. It is a good plan to accustom oneself to judge of the proper density by transmitted light. Some plates, being equally sensitive with others, take longer to develop on account of the greater hardness of the gelatine used in their manufacture. This indicates that sufficient *time* should be given before concluding they are under-exposed, and forcing the development by adding ammonia or other accelerator, with the invariable result of spoiling the negative.

Plates that develop slowly are generally slow only at first ; as soon as the developer has well penetrated the film they develop as rapidly as any other, so care must be taken not to overdo them. The same reason that causes slow development at the beginning also prevents the developer being rapidly removed, and there is a great probability that, if they are kept in the developer until they are sufficiently dense, after fixing they will be found to be much stronger than desirable. This is especially the case when carbonate of soda is the alkali used, for a carbonate of soda dense negative is more intractable to deal with than most other kinds.

The exposure will be found to influence the colour, using the same developer, and the colour greatly influences the printing. The longer the exposure has been, the warmer the colour of the negative. A negative that has had a long exposure, providing it is not over-exposed, develops a stronger printing image than one taking less time, the light being stronger, also properly

exposed. Note must be made of this in development, that it stops short of the usual time, or a too strong negative will result.

With hydrokinone, eikonogen, and rodinal, exceedingly good negatives can be made on glass or prints on bromide paper—for which latter purpose the pyro and ammonia is unsuitable. Up to the time of writing 'rodinal' has not been in use sufficiently long to pronounce absolutely upon its qualities, but it promises to be a very useful and convenient developer, giving images similar in colour to eikonogen, and working evenly and pleasantly; for interior work it seems especially useful.

Intensification is sometimes unavoidable, for which there is no better plan than that suggested by Dr. Monkhoven. The image is first bleached by bichloride of mercury, well washed, and followed by a bath of silver cyanide. In case of over-density being produced, a dip in a *weak* bath of hyposulphite of soda will remove it.

For portraiture, the mercurial bleaching should be followed by a bath of sulphite of soda instead of silver cyanide, as is best in cases where only a slight accession of density is required. It will be found very difficult or impossible to intensify properly an image that is too thin on account of improper exposure.

Two methods of reduction, almost equally good, are in use. One by treating the dense negative to a bath of perchloride of iron, followed by refixing in the hyposulphite bath; in this process, the silver forming the image is changed into a chloride that is dissolved in the hyposulphite. It acts quickly, and the process must be carefully watched, and not carried too far, or the pro-

bability is the whole of the image will be dissolved. The perchloride solution should be used weak, and the process repeated if the reduction is found, after fixing, to be insufficient. The other is a solution of five grains of ferridcyanide of potassium to the ounce of water, with twice as much hyposulphite of soda. This must be made fresh before use, and the plate removed rather before the full effect required is produced, as the reduction continues for a short time in the washing water. There is no after-fixing required with this plan. If too much ferridcyanide is used the image will dissolve off in patches, especially at the edges of the plate. An objection is sometimes raised to this method on account of the yellow colour of the resulting image; nevertheless it is an excellent plan, and negatives so treated print well.

CHAPTER XXII.

Improvement of Negatives—Chemical and Mechanical Means—Treatment of Over-exposed Negatives—Partial Reduction—Treatment of Too Dense Negatives—Removal of Objectionable Lights—Colour and Lead Pencil Work—Definition of Horizon in Seascapes—Papering—Cautions in Printing—Doctored Negatives—Equalisation of Negatives—Mending Broken Negatives—Printing Defective Negatives—Scratches—Cracks on Collodion Negatives, and Treatment—Revarnishing—Precautions, in the Treatment of Old Negatives—Spots on Gelatine Negatives—Varnishing and Collodionising—Stripping Films—Frilling: Its Cure.

IMPROVEMENT of negatives may be effected by various means, and there are few negatives so perfect but that considerable improvement cannot be made in them in one way or another.

There are certain alterations we can at once see the desirability of effecting as soon as the negative is dried,

and which have to be made by chemical means, or by the simple plan of rubbing down with a pad moistened with methylated spirit, or by scraping out with a sharp knife. Other alterations are not so easily judged until a print has been taken and the picture carefully examined. A negative may be good in all other respects, but owing to slight over-exposure, prints somewhat flat. If such a negative is intensified in the ordinary manner, we get a much slower printing one, and not very much improvement in contrast.

By subjecting the negative in the first place to the ferridcyanide and hyposulphite of soda bath until the very deepest shadows show *tolerably* clear, a white porcelain dish being used, the dish should show distinctly through the deepest shadows, but the image must not be wholly dissolved. The negative is now thoroughly washed and dried, then intensified by the Monkhoven formula. If properly done, the result will be a perfect negative.

Portions of a negative can be reduced by means of perchloride of iron solution (to which a little gum has been added to prevent it spreading) applied with a camel-hair pencil, and refixed afterwards in the hypo bath. Negatives a little too dense can be reduced by flooding the plate with weak hydrochloric acid, ten drops to the ounce of water, if the alum and citric acid bath is not sufficiently energetic. It takes effect almost immediately, and the full effect is obtained in a minute or two. A more prolonged application of it is apt to make the film frill; besides, there is no further gain in reduction, however long kept in contact with the film. If we find, on printing the negative, that there are isolated

high lights that look too conspicuous, giving a spotty effect to a mass of shadow, they had better be scraped down or removed altogether with a sharp knife; a wash of Indian ink or neutral grey may be put over portions of the negative that require brightening up or generally lightening. Working on them with lead pencil will often be an advantage. The introduction of a bright light on certain small portions with opaque colour or lead pencil will considerably increase the scale of tone in a soft, delicate negative, and not be noticeable on the print as a result of working-up.

Very often in a seascape the sky and sea amalgamate in the negative, when the horizon was quite distinguishable in nature; in this case, by aid of a ruler and pen dipped in Indian ink, make a straight line along the horizon, and soften off with shading into the sky with lead pencil, which will separate the two and effect a vast improvement. *Much* alteration being required, papier mineral fastened on the back of the negative and worked with colour or pencil over the portions needing it is a good plan, cutting away the paper where the image is sufficiently dense.

Interiors may be much improved by papering over the too dark portions on the back of the negative with tracing paper. When this plan is used, the negatives must not be printed in the direct sunshine, or the edges of the cut-out will show on the print.

A thin end of a negative may be improved if black-lead is rubbed over the gelatine surface with the fingers before varnishing and graduated into the rest, so that there is no abrupt end to the leading; the printing will be then equalised. A negative sometimes gets broken,

To make the best of it, procure another piece of glass the same size, make it hot, and spread Canada balsam thinly and evenly over it; on this arrange the broken pieces of negative, and press them into close contact with the glass support, the pieces being accurately adjusted with regard to each other. Lay it on a level table to set; and, as an additional security, when cold bind the edges of glass and negative together with paper.

When the Canada balsam has hardened, make up any defects where the film is broken with colour, and, in printing, print through one thickness of white blotting-paper. Carefully done, the cracks will be scarcely perceptible, if at all.

A negative merely *cracked* is better fastened to another piece of glass (with tracing-paper between them) by binding the edges together. In printing, the strongest light should fall on the negative lengthways of the crack, and not across it.

Should a piece of the film be accidentally torn out of the negative, the gap should be painted up to match the subject, a little colour dabbed on the back to harmonise it. Scratches and cracks in the film may be filled up by rubbing a little powdered blacklead over them with the finger; this especially applies to collodion films, but scratches on gelatine films may be considerably improved by the same process.

Collodion negatives, if kept in a damp place, are often affected with raised reticulations where the film and varnish separate from the glass, the least rubbing causes the film to break off, and so irretrievably spoils the negative. To deal with this, a flat dish sufficiently large should have a little spirit poured into it, and the

damaged negative laid face up on small blocks, just sufficient to raise it above the surface of the spirit, and the whole covered closely down. The vapour of the spirit will in a short time soften the varnish and collodion, and the raised parts will subside ; when this takes place the negative can be removed and placed in a rack to harden ; it can then be revarnished, and will have practically another lease of life,

It is not safe to revarnish any collodion negative that has been cleaned with cyanide of potassium, as the chances are the image will wholly or partially dissolve.

Many operators object to varnish their gelatine negatives, from a mistaken idea that the image is impoverished by the process, and that the gelatine is sufficiently robust to stand printing without damage. It must be borne in mind that unvarnished gelatine has a great affinity for silver nitrate, and if any damp or wet gets on them during printing, the negative will be irretrievably spoiled.

In an ordinary way, after a time, small brown spots will begin to show on the unvarnished negatives, and go gradually increasing in size, and eventually ruin the *cliché*. For this there is no perfect cure. Both bichloride of mercury and cyanide of potassium have been recommended, but the results are not altogether satisfactory. Even varnished negatives when hard worked are not exempt from this defect, so, as an extra protection, the negatives are collodionised with a good tough collodion before varnishing ; after being so protected there is, with ordinary care, little fear of damage.

If a negative has the glass broken, the film remaining intact, the best plan is to transfer the film to another

plate. To do this the broken negative is put in a dish with some very dilute hydrofluoric acid, when in a short time the film will float off the plate; carefully put it into clean water, introduce a fresh plate beneath it, raising them both together from the water, adjust the film and set them aside to dry.

Sometimes gelatine-bromide plates will, in hot weather, frill and blister. As soon as possible paint over the frilling parts with strong spirit; this will stop the frilling and reduce the frills already formed. *Let the plate dry*, and then, if the negative has not been sufficiently washed, it can be continued without any further danger from this cause.

CHAPTER XXIII.

Lenses (Wide and Narrow Angles)—Kind of Pictures produced—Dwarfing of Distance—Foregrounds out of Proportion—A Painter's idea of Distance—Correctness of Perspective—Method of Working in Landscapes—Objections to the use of only one Lens—Advantage of the Single Lens — Rapid Rectilinear Lens — Stops — Choice of Lenses — Covering Powers—Length of Focus—Testing Lens—Using Lenses in part—Calculation of Exposures—Single Lenses for Portraiture — Advantage of the Use of Single Lenses for Large Heads — Spectacle Lenses — Periscopic: How to Use Them for Photography—Ascertaining the Focus—Adjustment—Mounting — Stops — Precautions—Focussing—Exposure—Wide Angles—Centering—Polishing—Care of Lenses—Portrait Lens—Kind of Image—Effect of Stopping-down—Application of Swing-back of Camera—Reflected Light inside Camera—Screens.

LENSES.—An important part of the photographic outfit is the lens, and about it there exists much misconception. Lenses have, perhaps, been more written about than anything else pertaining to photography, and yet

the remarks frequently made show that they are but imperfectly understood by very many who amuse themselves with photography. The advantage of knowing something about them by all who use them is indisputable. Lenses may be roughly classed into wide and narrow angle.

I will take the opportunity of again saying that a narrow angle lens, if it will include the amount of subject desired, gives more artistic results than one including a very wide angle. As a matter of course, the more subject included on a plate the smaller will be the proportionate image. Wide angle lenses dwarf the distances and give apparently exaggerated proportions to the foreground. Generally speaking, a picture looks better if the distance is represented of important proportions than if it is on a very diminished scale. The impression caused by the real distance is to considerably enlarge it, and, to perpetuate this impression, painters have generally deviated from the truth by representing the distance on too large a scale for the rest of the picture. A narrow angle lens does not apparently dwarf the distance in anything like the same degree.

Although no photograph taken with lenses in general use gives sufficient size to the distance, or rather the impression we have of it, there is no disputing the correctness of the perspective.

In taking a view or landscape the best position for the camera should first be selected, *then* a lens of an angle sufficient to include all that may be desired from that particular point of sight. If only one lens is available the probability is that the best point of sight for that par-

ticular subject cannot be taken, but the operator has to dodge about and find some view to *suit his lens*. This alone shows how necessary, for the best work, it is to have lenses of a variety of foci, so that the lens may be suited to the picture, and not the picture to the lens. For outdoor work nothing beats a good single lens or equals it. A single lens has fewer reflecting surfaces, and gives a crisper and brighter image than other lenses. It is necessarily worked with a rather small stop, but, unless for instantaneous work with moving figures, this is of little consequence, as it is sufficiently rapid for other kinds of work. That single lenses do not give straight lines, and that they are therefore unsuitable for architectural subjects, is a charge frequently brought against them. This is in a measure correct, if the architecture occupies the margin or near the margin of the picture, but if it only occupies the central part of the plate the distortion is practically nil, and under such circumstances a single lens may be used with as good effect as a rectilinear lens. A thoroughly good single lens is one of the best a photographer can use.

The rapid rectilinear lens has the advantage of working with a much larger stop, and giving straight lines over the whole of the image, with definition equal to the single lens with a small stop. On this account it is preferred for instantaneous work and architecture. The stops with this class of lens are placed between the combinations instead of in front, as with the single lens. In choosing a lens, it should cover the sized plate it is advertised to do perfectly with a full aperture, the objects to be depicted being on *one* plane, and the more depth of definition it has *without* a stop the better it is.

Many lenses fail to do anything like this, or to cover the field advertised with even approximate sharpness, unless a very small stop is used, which, although it may enable us to get a sharp picture, is at the sacrifice of rapidity.

The focus of a wide angle lens is usually about half the length of the plate it is advertised to cover; say, for an eight and a half inch plate the focus of the wide angle lens would be about four and a half inches. An ordinary angle lens for the same sized plate would be ten or eleven inches. This will give some idea of the proportion of the focal length to the amount of picture included. In testing a lens, first ascertain its focal length. Some object in the distance, say, the sun, should be sharply defined on the screen, then a rule placed against the lens, touching it, and the distance between it and the screen noted; this will be the *solar* or *back* focus.

The *equivalent* focus is measured from the stop in a compound lens, and not from the back combination. Good compound lenses may be taken apart, and made available for work separately. If the lenses are symmetrical, that is, both combinations of the same form, one may be removed from the mount, the remaining lens giving a focus double the length of the two combined, and theoretically requiring four times the exposure. It is best to remove the front lens, so that the stop is left in front. The remaining lens should be turned round, but, if it is left in its original position, the difference is scarcely perceptible. With other lenses not symmetrical, such as Dallmeyer D lens, each combination will give a different sized image, a fact that may be found

useful on occasion, providing there is sufficient length of camera to enable one to take advantage of the increased length of focus. As to calculating the exposure, it is supposed to increase in proportion to the square of the distance.

The size of the stop being known, and the focus of the lens being ascertained, it is easy to ascertain what the exposure should be, knowing what exposure was required with the same stop with the complete lens. This rough and ready method might not satisfy an optician, but a photographer is not so exacting, and if he can get several sized pictures with one lens, of fair definition, it is a decided advantage.

A good single lens is an excellent instrument for some kinds of portraiture when excessive rapidity is not required, and also for large heads; very much better than straining a portrait lens, small for the size of the work, which is often the case. The single lens will give a more truthful picture, and in altogether better drawing than the portrait lens close up to the sitter. Lenses may be extemporised from *Periscopic* spectacle glasses, and excellent results obtained. The principal drawback is their comparative slowness, but with respect to definition, rectilinearity, covering power, and depth of definition they are equally as good for ordinary photographic work as the expensive orthodox lens. The way to set about it is this: Procure a couple of concavo-convex (periscopic) spectacle lenses of pebble of, say, twenty-four inch focus; place them accurately together, *concave* sides inwards, and keep them in place with small pieces of gummed paper. Obtain a short piece of brass tube three-quarters of an inch long, cut out two

discs that will fit the tube closely, with an aperture of about half an inch in the centre of each. Fit one firmly into the tube, then put in the joined lenses, and afterwards the other disc, pressing all closely together, so that the lenses will be upright in the tube, and kept firmly in position; *in front and close to the lens* put another disc of thin metal—in which an aperture has been drilled one-sixteenth of an inch in diameter, both sides bevelled—to form a stop. The tube containing the lenses must now be fixed in front of the camera in the usual position of the lens. All the inside of tube and discs had better be covered with dead black paint. The lens is now complete.

Remove the small stop in front in order to get the focus, which probably will not be sharp at best. Focus on the most *distant* object in the view, as, theoretically, the actinic focus is about a fortieth shorter than the visual focus. Insert the stop, and make the exposure, which will probably be about five seconds; on a well-lighted subject, it would require two seconds with an ordinary lens working at *f*-64. The focus of this lens will be 12 inches. In all combinations of spectacle lenses of this kind, the focus will be about half that of the shortest focus lens employed. A lens of 24 inch focus with one of 12 inch focus, will make a wide angle lens of about 6 inches on a whole plate. A stop of a twentieth of an inch will be suitable for this latter combination. In fitting lenses of different sizes together, see that their *centres* are truly in a line with each other, and that they are set upright in the tube. These lenses will not work properly *without* a small stop, but with one, they give most excellent results in all respects,

brilliant images, straight lines, and depth of definition. All lenses should be carefully polished with a soft piece of chamois leather before use, and their temperature should be the same as the place in which they are used, to prevent condensation of moisture on their surfaces.

The portrait lens works sharply with a large aperture, but has a round field and not a great deal of depth of definition; on this account, the different planes are not equally sharp. In a profile view the face may be perfectly well defined, but the shoulders will not be so. No lens gives such absolute sharpness over a small area, with a large aperture, as the portrait combination; by stopping it down, definition over the whole plate is, of course, improved, and a depth of definition increased, but at the sacrifice of its most valuable quality, rapidity. Improvement in definition with full aperture is obtained by judicious use of the swing back of the camera.

When lenses are worked that will cover much more than the plate they are used upon, there is a considerable amount of light thrown upon the inside of the camera, which is more or less reflected on to the plate, to its great detriment, especially in long exposures, with very sensitive plates. To obviate this, a screen made of cardboard or other thin material, and dead-blacked, is fixed inside the camera, a few inches in front of the plate, its distance from the plate being regulated by the size of the aperture. Some use two or more of these screens a few inches apart: the shape of the opening is proportional to the plates used. The improvement in the

quality of the negatives will be considerable, especially if the inside of the camera was at all shiny with age or use. Considering the advantages of this plan, and the ease with which it may be applied, it is surprising so few make use of it.

CHAPTER XXIV.

The Dark Room—Its Requirements—Stoneware and Lead Sinks—Lighting—Fixing Bath—The Dark Room as a Camera—Dark Room Windows—Protecting the Eyes—Oscillating Table—Cupboards.

THE dark room should be well ventilated, with plenty of safe light variable at discretion, plenty of room, plenty of water, and plenty of counter-space. No bottles, jars or parcels should be stored in it except those required for use. The walls and ceiling should be varnished and washable, and every precaution taken to promote cleanliness and order, and avoid dust.

Although stoneware sinks are very excellent, I give the preference to a sink lined with lead. There is then less danger of breakages. A glass measure set down sharply on stoneware is apt to damage it, or a negative let slip from the fingers is almost sure to break if it falls on the hard surface. The lead being comparatively soft, troubles of this sort are minimized. Of course, the stoneware could be covered with sheet rubber or cork, but they seldom are.

Artificial light is preferable to daylight, being more constant in quality but the source of light should be outside the room.

The fixing bath is best by itself on a small table provided for it, under which the stock of hypo can be stored.

If the situation of the dark room permits it, arrangements should be made for copying transparencies, bromide work, and enlargements, the room itself constituting the camera.

The dark room windows should consist of sliding frames glazed, one with deep orange, one with ruby and one with plain glass, so that they can be used together or separately. A blind of canary medium on a roller before them all. This arrangement will provide lights suitable for the development of any kind of plate; it is a great comfort to the eyes if an opaque screen projects from above the window, cutting off all light from the eyes and reflecting it on the plate. A board suspended from four rings in the ceiling to its four corners by an endless cord, forms a good oscillating table for developments, and can be kept in motion by an occasional touch. A cupboard, perfectly light tight, and fitted with shelves is a very useful addition to the dark room conveniences.

Chapter XXV.

Tripods and Camera Stands—Rigidity—Old-fashioned Tripod—The Table Head—How to Make One—The Studio Stand—The Lever Caster—Support for Dark Slides—Hood—Focussing Cloths—Storing Negatives—Bags—Cards—Vignetting—Plain and Serrated Vignette Cards—Printing Vignettes—Flashed Orange Vignette Glasses.

Tripods, to be really useful, must be quite free from vibration when set up. The numerous flimsy, weak-kneed affairs one often sees are answerable for much

bad work. It is better to sacrifice a certain amount of portability and ensure rigidity than have lightness without it. For actual hard work nothing is better than the old-fashioned tripod with the legs in one length, it is somewhat heavy and inconvenient compared with many modern stands, but it has the advantage of solidity and firmness under trying circumstances, and will stand an immense amount of rough usage without getting out of order. In all stands it is important that the head of it should be large, as large as the base board of the camera. Tripods are seldom supplied with heads of this size, the general idea is to make them as small as possible, for portability and appearance sake. If the top is the same size as the camera base it can remain screwed to it, so that the additional encumbrance is but trifling. A light deal drawing-board, covered with black velvet is all that is required.

The studio stand is altogether another affair, and cannot very well be too solid. There are numerous forms in the market calculated to suit most tastes. It should be easily moved about by a proper arrangement of casters. One on the American lever principle allows of easy movement, and the stand is fixed firmly, with no danger of moving when it is once placed in position. A shelf should also be attached, on which dark slides can be set preparatory to being inserted into the camera, as it is often very inconvenient to have to find some place in the studio to set the charged slides safely till required.

A wire frame hood to support the focussing cloth and keep it clear of the head when examining the image on the ground glass is an addition acceptable to

most photographers. This hood is sometimes fixed to the back of the camera. Much depends on the kind of camera and apparatus used for which it is the most convenient.

Black silk is by far the most suitable material for a focussing cloth for the studio, and it should be of generous dimensions. There is no necessity whatever for the double velvet heavy cloths so often used. Even out of doors one thickness of thin velveteen is sufficient for all practical purposes; if it is lined with *black* twill it will add to the enduring qualities, although quite unnecessary for shading the camera whilst focussing. The idea of lining the black focussing cloth with yellow seems to me a rather useless proceeding. If the black material used is good, it is quite sufficient to keep off any stray light likely to injure the plates, and the introduction of bright yellow rather interferes with the examination of the image on the focussing screen than otherwise. If a non-actinic colour is preferred, a dark ruby would be more to the purpose.

Storing negatives, when in large numbers, requires careful consideration. For amateurs the plan of putting each in a bag and labelling is good as any, but a more systematic way is necessary for the professional. Many prefer bags labelled, numbered, and put on shelves in proper sequence with regard to both number and material, and for portraits this is perhaps as convenient a method as any, also economical of space.

Another very good plan is to put them in suitably sized boxes with a smooth hard card between them, the top edge of the card projecting above the negative, and numbered with reference to the negatives immediately

in front of it; on the outside of the box the first and last numbers contained in it is printed. This provides a rapid method of finding them, and is adopted by several large firms.

Vignetting is effected in a variety of ways, good, bad, and indifferent; the result desired, is to produce a gradual and almost imperceptible shading from the darkest part near the figure to the lightest part of the margin. A small but suitably shaped aperture in a card covered with waxed paper and regulated by its nearness or distance from the negative is one of the best plans; sometimes two cards can be used with advantage.

A printing frame is taken, the negative put in it, and a vignetting card tacked to the outside of the frame; by holding it to the light, it will be seen if the vignette is suitable in shape and right for distance; if too near, it can be packed up with strips of card between it and the frame until the proper distance is attained, and the whole tacked down. An additional card, with the opening covered with wax paper next the frame and under the packing, so that there will be a little distance between the two vignetting cards, has a wonderful softening effect.

Another plan is to have cards or thin zinc plates with different sized and shaped serrated openings to be laid on the outside of the printing frame; any shape can be produced by selecting suitable cards. Sometimes special forms are wanted that can only be made by cutting openings especially to suit the negative. The printing is best done in diffused light. With large negatives, a piece of stout strawboard has an opening cut in it and the edge packed with cotton wool, the fibre being drawn

out evenly and carefully to give a properly graduated tint.

Where vignetting operations are carried on, there should always be a good supply of the necessary materials at hand, for frequently some alteration has to be made during the printing that requires prompt attention. There are numerous vignetting devices in the market, but all embodying one or other of these principles.

No *worse* plan can be adopted than the use of flashed orange-vignetting glasses in which the central colour is ground off, as they almost always produce an inartistic result, and give an exceedingly commonplace appearance to the majority of prints.

CHAPTER XXVI.

Collecting Residues — Silver Chloride — Silver Sulphide — Gold — Precipitation — Precautions against Waste — Reducing — Gold Chloride — Chloride of Gold and Calcium — Precautions — Stock Solution of Gold Chloride.

RESIDUES are well worth collecting where much work is done, the collection being made in three separate vessels, one for the chlorides produced from the washing-water of prints and vessels used for solutions containing silver nitrate, another for waste hyposulphite solutions, and another for gold toning baths and the first wash-water of the prints after toning. For the chlorides, the milky water from washing the prints, &c., is left to accumulate until the pan is nearly full; sufficient hydrochloric acid is added to precipitate the silver; as soon as the precipitate has subsided, a few drops more

of the acid are added to the supernatant clear solution for the purpose of ascertaining if all the silver has been thrown down, which will be indicated by the liquid remaining clear; if it becomes opalescent it indicates some silver still remains in solution, and a little more acid must be added, and the whole stirred up and again left to settle. When the clear water can be drawn off to make room for fresh additions, a sufficiency of residue being collected, it is gathered and put into a thick flannel strainer to well drain, and then transferred to a pan to be thoroughly dried over a fire.

With the waste gold baths, sulphate of iron, made acid with sulphuric acid, is used as a precipitant, and when a sufficiency of residue has accumulated it is collected by pouring the mud on to a *paper filter* and drying; as the precipitate consists of nearly pure gold in a fine state of division, care in its collection is almost a superfluous recommendation.

With the waste hypo baths and other odds and ends of valuable waste solutions, a sufficiency of liver of sulphur, dissolved in water, is added until the liquid smells slightly of the sulphide—for until there remains a slight odour some silver probably remains unprecipitated, so it is just as well to test the supernatant fluid with a little of the sulphide solution before throwing it away; the probability is it will become cloudy, with a yellowish cloudiness that may be neglected; it is only when a brown muddiness is produced that any silver remains in the solution worth precipitating. This precipitate is also poured in to a thick flannel filter to drain, and then may be dried off as in the case of chloride. When all are dried they should be weighed and sent in separate

parcels, properly labelled with their weights on them, to the refiner, unless the photographer has appliances for reducing his own residues.

In case of the gold residue it can be advantageously turned into chloride by the photographer who has no convenience for the reduction of the silver. Should this be determined upon, in the first place the gold powder must be put in a flask and well washed with a number of changes of water, taking the precaution to pour off the washing-water through a filter in case any of the gold is poured with it; lastly, pour all into the filter and dry. Now, weigh the gold, and put it into a flask on a sand bath, and add, for every ounce of gold, one ounce of pure nitric acid, three ounces of pure hydrochloric, and one ounce of water, apply heat to the sand until the gold is dissolved.

The whole should be placed somewhere so that the fumes engendered are carried away—on the hob of the fireplace for instance—there will probably be a little white precipitate of silver chloride which may be neglected.

As soon as the gold is all dissolved, the bright yellow solution is to be poured into a Berlin basin, into which four times as much crystallised chloride of calcium is placed as the gold dissolved; this is put on a sand bath over the fire, on a gas furnace by preference, until the compound salt of gold and calcium is almost dry, frequently stirring with a glass rod, care being taken not to apply too great heat, which would result in the reduction of some of the gold chloride to metallic gold, necessitating a re-solution and evaporation.

When almost dry remove from the fire and let cool, when it will become one opaque, hard, yellow mass.

This is the salt of gold and calcium in a proper state for use. For convenience this salt is dissolved in water, in which it is very soluble, in the proportion of eight grains to the ounce of water for every grain of gold originally added, when it can be stored for use, and will keep an indefinite time without change, and will tone more prints proportionally than ordinary ready-made gold chloride. One ounce of pure gold will make a Winchester quart of solution of the usual strength of a grain to the drachm.

CHAPTER XXVII.

The Glass Room—Conditions Required—Forms—Copying and Portraiture—Size and Shape—Amount of Glazing—Lavatory—Dark-room—Colour of Woodwork and Walls—Backgrounds—Furniture—Height of Chairs—Blinds—O. G. Rejlander—His Studio and Opinion—The Floor—Incongruity of Accessories—Cleaning the Glass—Cooling in Hot Weather.

THE glass room or studio is *the* important room of the photographic premises, and much care has been bestowed in designing rooms, calculated to give the most artistic effects, with the least trouble. Many eccentric forms have been advocated by their designers, but whether the advantages claimed for them came up to expectation is an open question. During the past twenty years many ideas have been revolutionised, so to say, and amongst them the idea of eccentric forms for photographic glass rooms. In building, the exigencies of the situation have to be taken into account, but where

there are no restrictions and an open space for the photographer to do as he pleases with, the following plan will always give satisfaction.

The greater number of photographers are limited to one glass room, and as all processes requiring a glass room have to be worked in it some sort of compromise must be arrived at, as copying work pure and simple and portrait work each require different accommodation. A large room somewhat oblong in shape is perhaps the most useful, say, thirty-five feet by twenty-five as the area, with a ridge roof, the apex of the ridge being much nearer on one side than the other; glazed on the longest side to within six feet of each end, and the other or smaller side of the roof slated. One side of the room to be glazed within a foot of the floor, to meet the glass side of the roof, the height of this side ten feet, and the greatest height to the ridge, sixteen or seventeen feet; the other side and ends substantial brick work. The advantage of rather high sides is for the greater convenience of moving backgrounds; as far as the effect of light goes it makes no difference.

At one end, outside this glass room, should be two other rooms, one a lavatory and the other the dark room; a small window, glazed with orange glass, should permit the photographer to see what is going on in the studio during the time he is shut up in the dark-room, without the chance of him being himself observed.

The end walls should be prepared themselves as backgrounds, independent of any others that may form the furnishing. The old fashioned way of having a particular place at each end for the sitter is exploded, and sitters now are placed all over the studio, according to

the effect of light and shade desired, and a background is wheeled up to suit the situation.

The furnishing should be like an ordinary room, with variously shaped chairs, tables, &c., but not of a *photographic* pattern; the less deviation there is from real life the better with one exception, and that is the chair bottoms should not be very soft and springy, with perhaps the concession of softness to a lounge chair or two. The height of the chair seats should vary, a low seat for a sitter rather long in the legs gives an awkward pose. A stool without any back and rather high is the best for vignettes, a footstool being supplied for the comfort of shorter persons. The blinds already alluded to should cover every inch of glass when pulled together, and the glass itself covered with waxed paper.

In such a studio any kind of lighting may be had. For the colour of the wood-work and walls a pale bluish grey is good as any. The browns and reds sometimes used, although giving a comfortable appearance lengthen the exposures considerably, and are apt to cause heavy shadows.

Going back a quarter of a century or more we find the then best exponent of portraiture in this country, Mr. O. G. Rejlander, practically carried out the principles now adopted, although they were rather contrary to popular opinion at the time. To be unconventional was his leading idea, and in his small studio one large pane of glass formed his skylight, and windows on one side of his glass room were covered with muslin curtains. He found that numerous sash bars tended to spoil expression by dazzling the eye. His studio in the Malden Road, Kentish Town, was a small unpretentious affair, but the

work done in it is an example, in the matter of lighting and expression, of what should be done with portraits of to-day. Part of the floor is best covered with a good carpet of a quiet pattern with plenty of rugs of different kinds lying about, the whole of the floor covered with a substantial oil floorcloth. As to accessories and such like, the photographer must consult his own taste.

The designs of all backgrounds should be suggestive rather than clearly painted out, and when the floor is included in the picture nothing so incongruous as a carpet or indoor furniture to an outdoor view should ever be permitted. The bottom of the background should not show distinctly from the floor. In all studios provision should be made for easily cleaning the outside of the glass, and for good ventilation. A strong canvas covering made to cover the roof at a few inches from it, and over which water can play, is an effective method of cooling in the very hot weather. The position of the studio should be east and west, with glass on the north side; light from other directions is somewhat unmanageable in sunny weather.

CHAPTER XXVIII.

Home Portraiture—Precautions—Difference between Home and Studio Work—Arrangement of Camera—The Window—Softening the Light—Reflectors—Position of Sitter—Exposure—Size of Portrait—Dresses—Out of Doors—Selection of Background—Objections to Foliage.

HOME portraiture is very successfully managed now we have the advantage of rapid dry plates. There are, however, certain precautions to be used in order to

get thoroughly satisfactory work. The chief difference between home portraiture and that done in the studio is in the character of the negatives owing to the entire absence of toplight when daylight is used, and the work is in the ordinary dwelling-room. Home portraiture may of course be out of doors or in some apartment in which there is a skylight, and so more nearly approximate to studio work.

The greater portion of the work, is, however, taken in rooms where top light is absent and the side window is the only source of light available. The camera should be placed near to and on one side of the window, with a north light if possible, but if the sun shines into it some sheets of waxed paper had better be tacked up in order to prevent that abrupt contrast of light and shade that without some such scheme would be inevitable.

The sitter is placed rather back into the room on the opposite side of the window to the camera, and a number of reflectors in the shape of white tablecloths or sheets so disposed as to properly light up the shadows, which without this precaution would come out quite black. The exposure is usually rather long, but it is impossible to say any particular time, varying as it does with the surroundings. With a portrait lens working at *f*-8, about four or five seconds, or less, would suffice in many rooms, when in others it would require twenty or thirty at least.

It is generally better to confine home portraiture to heads and busts or three-quarter figures than to full lengths, as more likely to give satisfaction.

To get a full length figure sufficiently small, more space to work in is required than that usually available, and the lighting of a full length figure is very much

more difficult under these conditions than the bust or three-quarter length.

If the sitters can be persuaded to wear white or light-coloured dresses so much the better. Rapid plates and the largest workable opening to the lens is indicated.

In portraiture out of doors a shady part should be selected, with, if possible, a high wall or building at the back. If a screen can be extemporised to go over the head it is a decided advantage. If there is choice of position, the light should be selected stronger on one side than the other.

A portable studio being available, the conditions are much the same as in a glass room. Out-of-door exposures are generally short, and the negatives should not be made very dense, for the extra brilliance of the light gives a tendency to hardness. As to posing and general arrangements, they must be left to the skill of the operator.

With respect to suitable backgrounds for outdoor portraits, groups may often be taken to advantage in the portico of the house. If the buildings are of suitable elevation, many other parts may be utilised for this purpose. The most unsuitable is when the background is composed of dark-coloured, *bright*-leaved shrubs; then the foliage is apt to reflect many disturbing points of light, and when they occur near the face it is usually to the detriment of the portrait.

CHAPTER XXIX.

Copying a Paper Photograph—Blocking Out—Printing in Clouds—Drying Negatives—Cleaning the Margins of Prints—Preventing Stoppers of Glass Bottles Sticking—Loosening Fixed Stoppers—Testing Card Mounts—View Meter—How to Ascertain the Proper Proportion of Rectilinear Forms.

REMARKS ON VARIOUS PLANS AND PROCESSES.—In copying an unmounted photograph, a good plan to avoid granulation is to well moisten the print with water and place it in optical contact with a clean piece of glass, free from defects; this will most likely degrade the lights of the photograph, especially if it is on thin paper; so to overcome this difficulty three or four thicknesses of moistened white paper are put at the back, and another piece of glass over them. The photograph, after the glass to which it is attached has been nicely cleaned, is now in an excellent condition to be copied. The only care is avoid reflection, by screening off the front light with a dark cloth; a strong side or top light gives the best results.

Blacking out skies or parts of a negative is best done with Bates' Black Varnish. In following the intricacies of architectural detail the black varnish is apt to spread and cover portions that should be left untouched. To avoid this, blacken the part for about an eighth of an inch in width with Indian ink, painted on with a fine brush, carefully round the subject, instead of the varnish, which will permit the more delicate tracery being stopped out without difficulty. The outline being painted, the greater space may be blacked out with black or opaque paper pasted on, or it can be done with Bates' Black. In

applying varnish to stop out a sky, let the negative be placed in a sloping position, sky downwards, so that in case of a too plentiful application of varnish it may run away from the subject instead of on to it.

To print in clouds to negatives the best way is to lay the print to be clouded on a piece of flat glass, adjust the cloud negative on it, and then screen off the landscape part by a cloth laid loosely on it doubled so that the folds of the cloth somewhat follow the outline of the landscape. Dark objects require no special screening, but light ones do. In case of church spires or similar objects projecting into the sky, it is as well to print a print and cut out a mask, and lay it over the subject in addition to the cloth. If the spire, &c., is of large size the cut out print should be fastened on to a pane of glass, which increases the convenience of working, but the glass must be sufficiently large to entirely cover the sky of the print being treated, or its edges will cause defects. Distortion of portraits by the stretching of paper and its remedy has been alluded to, but if prints are mounted wet, they should all be printed the same way of the paper, with no unnecessary stretching at the time they are laid on the mounts, so that they are all alike when finished ; judgment should also be exercised in order not to give extra length to a long face or extra breadth to a short one.

After negatives are washed, the surface moisture should be removed with a soft, moist wash-leather, and their drying can be much expedited if they are laid for a few minutes in a bath of methylated spirit, or until the spirit leaves the plate, on taking it out, in an even wave.

The margins of mounted prints can be nicely cleaned

by rubbing them with a crushed up piece of white blotting paper.

Stoppers in glass bottles will not stick if a little vaseline is rubbed on them, or if they are warmed and rubbed with a piece of white wax. If a stopper becomes fixed, gently warming the neck of the bottle with either a spirit lamp flame or by friction with string, will generally expedite its removal. In obstinate cases if a solvent of the adhesive matter is dropped round the stopper, and it is allowed to remain undisturbed a short time with occasional application of the solvent as it evaporates, and gently tapping one edge of the stopper with a knife handle, the thumb of the other hand pressing against it upwards, the stopper can be released.

Some card mounts will, after a time, destroy the print or stain them if exposed to damp. To test them, lay a silver print on one of the mounts covered with damp blotting-paper, and this again covered with a piece of glass, and place aside for a day or two ; if there is anything obnoxious in the mount, examination of the moist print will show it.

A view-meter can be easily improvised by taking a small piece of thin metal, and cutting out in it a small aperture proportioned to the plates used. A short piece of string is fastened to it. Standing behind the camera the image is seen when the ground glass and this metal frame are held in the hand and looked through until the distance from the eye permits the same amount of subject to be seen through them as is on the focussing screen. A knot is then made in the string pressed against the cheek bone, so that the distance from the eye to the screen may in future be the same. The images pro-

duced by all lenses to be used with that sight plate should be judged in the same manner, and knots in the string made to correspond with them. It will now be easy to ascertain how much of a view will be included on the plate, with any of the lenses, and also what lens it will be best to employ without the trouble of setting up the camera. To obtain the correct proportional size of a rectilinear opening, draw a line diagonally from corner to corner of a diagram showing the size of plates used; then any space included within lines drawn parallel with the top and side, meeting at the diagonal, will give it.

CHAPTER XXX.

Double or Composition Printing—Various Methods Adopted—Registration—Mounting Panoramic Pictures—Joining—Negatives and Prints.

PRINTING from several negatives on one picture is necessary in many cases, and provides a method of picture-making by photography that has been brought to great perfection, in one manner, by Mr. H. P. Robinson; and, in another, by Mr. Adam Distin. I mention the names of these gentlemen, as their works are, perhaps, more familiar to the generality of photographers of the present day than many others who have also produced exceedingly meritorious work, the results in both cases being achieved by widely different means, so far as outsiders are permitted to know.

Little tricks and dodges of working are, no doubt, used by both, the outcome of great practice and enthu-

siastic labour, and, as such, are not public property; but I believe I am correct in saying that Mr. H. P. Robinson's prints are produced from different and separate negatives, and that Mr. Adam Distin's are from one negative, made up of several by the removal of different portions of the ground work negative, so to say, and superposing portions of others on this prepared groundwork; finally varnishing the whole, and printing from it as one negative. It is almost superfluous to say, great care, skill, and artistic ability are required to obtain good results by either means.

The simplest double printing, so called, is putting clouds into a landscape; the next, adding a landscape to a figure, or the introduction of an additional figure to a group. However, very much more skill is required for either of these than the addition of clouds to a landscape.

Some years ago, Mr. Thos. Edge, of Preston in Lancashire, and Llandudno in North Wales, astonished the photographic world by producing some most exquisite C. D. V. gems with natural landscape backgrounds. The artistic and masterly treatment bestowed on these small pictures was very considerable, and the result was simply charming, winning golden opinions from all who saw them. The process adopted was somewhat tedious, and many prints were wasted to get one perfect one; but the perfect print in my opinion, *as a picture*, repaid one for all the extra trouble bestowed. Such work could not be produced at the lower prices ruling in the present day, but, in cases where the remuneration is equivalent, this kind of picture should command a ready sale; but it is a *sine quâ non* that the work *must* be artistic. There

is no medium, and the results are either beautiful or abominable.

The following is a sketch of the process :—A natural foreground was built up in the studio (Mr. Edge had a studio especially constructed for this class of work) with growing plants, real boulders, and stones, old fencing, &c. Nothing was artificial except the composition of the design.

This foreground was arranged about eight feet from a large background, painted in grey, from light at the top, graduating to darker at the bottom, and was fixed sloping forward at the top. Ordinary bright oil colour was used, but the inclination of the frame prevented any interfering reflections ; this, together with its distance from the sitter, gave a very aerial effect to the background, and caused the foreground to amalgamate with the introduced landscape without showing any signs of the junction. The landscape to be added was merely a thin, fully exposed, landscape, specially selected for the purpose. A number of different views were taken, so that there might be plenty of variety, and no unavoidable repetition, which would be the case if limited to a few subjects.

The *modus operandi* was as follows :—The negative containing the sitter was printed in the ordinary manner, and then a piece of glass was laid over the print, and, with black varnish, a mask was painted carefully to cover the figure and foreground. A suitable landscape was selected, and the figure print laid down on it in an ordinary printing frame, the glass mask carefully adjusted over the figure, and kept in place by bits of gummed paper, and the whole laid at the bottom of a

deep box, and exposed to diffused light. The box was for the purpose of securing parallel rays of light; any lateral light would, of course, make a defect by throwing the shadow of the mask beyond the figure. It will thus be seen there was considerable risk of spoiling the results by the mask not confining its effects to the figure alone. To avoid this waste and trouble I devised the plan of painting over the parts that required masking *on the print itself* with a thick paint of gamboge, and letting them dry before printing the landscape; it answered very well indeed, and was not very much trouble—nothing like the original plan. The paint washed off in the washing water and left no stain or discolouration whatever, and it quite did away with waste from improperly masking, besides giving increased facilities in adjusting the landscape. *This painting out on the print will be found useful for other purposes when masking out is required.*

The greatest difficulty in double printing is getting accurate registration of the different *clichés*, and in stopping out accurately on each negative those portions not required. Care, skill, and good stopping are the only things required to bring matters to a successful issue; in fact, all double or composite printing depends more on the man than the process. When several negatives are used, they should be about the same quality to ensure uniformity in the colour of the print, and the print altogether should be made as rapidly as it conveniently can be. A dull, bad printing light should therefore be avoided for this class of work.

Panoramic pictures made of several negatives are almost always more satisfactory if the different sections

are mounted with a slight division between them, instead of being vignetted one into the other, or absolutely touching each other. It so rarely happens that each negative is exactly the same density at the edges as the one to which it will be joined; a little difference in colour is quite sufficient to give a patchwork appearance to the picture, which is avoided by mounting them slightly apart.

With wet-collodion negatives the removal of the image is easily effected with a solution of iodine in cyanide of potassium, but with gelatine films there is danger of stains. When making compound negatives, films stripped off the glass, after being cut to the right form *before* removal, are to be preferred. The chief difficulty in transferring small, thin pieces of film is their tendency to curl; to prevent this, after cutting and before stripping, temporarily attach a semi-transparent piece of smooth paper, with indiarubber solution, which can be removed after the transfer is effected, and let the film dry under pressure. In joining two prints forming parts of the same picture, cut one of them through, following the darker lines of the subject, this will leave an irregular outline; if the paper at the back of the edge is carefully rubbed off so that it leaves the edge very thin, the junction will be scarcely noticeable; if the edges of the lower part are treated in the same manner, and dried under pressure, it will be almost impossible to detect, without very close scrutiny, that the two pictures are not one piece of paper, that is, providing the printing has been well done.

CHAPTER XXXI.

General remarks on Out-door Photography—The Selection of Subjects—Effect of Colour—Foregrounds and Distances—Water, Waterfalls and Lakes—Points of Sight—Quality of Negatives.

As an addenda to the foregoing chapters and emphasising certain points, a few remarks on what to select and what to avoid when roaming in search of the picturesque, may not be out of place. As a preliminary the photographer must school himself to judge of a view unbiassed by the effects of colour; it seems a sufficiently simple matter, but is far from being as easy as it appears, for not only the beginner but the experienced is sometimes misled in this respect. The mind is unconsciously influenced by the effect of colours, which not unfrequently take the place of lights and shadows, and it is not until we see the woeful falling off of effect in the photograph that we realise the false impressions we had received.

In a portrait, a beautiful face and figure will with most bias the judgment in its favour when being examined for merely technical qualities, and the worst of it is, we cannot altogether free ourselves from this involuntary influence, which distracts the judgment in spite of ourselves; then, when we find out the mistake, it is too late to make any alteration. Many landscapes that appear extremely charming to the eye would, in the photograph, fail to attract a second look. So to avoid

being misled, the photographer should train himself to estimate a view solely on the merits of its chiaroscuro. It is an excellent plan to make use of a piece of neutral tinted glass that will kill the colour, leaving the forms and disposition of light and shade to be judged at their true value, free from its disturbing influence, for this, with our present knowledge, is all we are able to represent by photography, whatever we may do in the future.

Extensive panoramic views, unless they have some very pronounced features, are usually disappointing in the photograph. Distance and middle distance are chiefly valuable as additions to good foregrounds, but scarcely suitable for picture making on their own merits. Their effectiveness almost entirely depends on their colour, which is lost in the photograph.

The foreground must receive special attention, as the pictorial value of the photograph depends greatly upon it. There are, of course, exceptions to every rule, but, generally speaking, a thoroughly good foreground will ensure a good picture when an indifferent one would be a failure. No trouble can be considered thrown away in perfecting the foreground as much as possible; it is this part of the view that lends itself to artistic manipulation by the introduction or removal of various objects that may help or spoil the composition. A very plain bit of foreground, such as a smooth grassy bank, may be vastly improved by the transference of some growing plant, old fencing, stones, or any odds and ends that may be suitable and near at hand.

Some photographers go even beyond this by making living animals, *per fas et nefas*, subject to their ideas of

the picturesque. One very successful picture of a hilly scene, nothing much in itself, was transformed into a really pretty picture by the expedient of tethering a number of sheep to small stakes driven into the ground in exactly the right places for picturesque effect; it required the closest scrutiny to detect anything unusual, even when attention was directed to the way in which it was done, the stakes being hidden or confused with the herbage. The arrangement of the animals seemed purely accidental, so well was it all managed. This is, however, going to extremes, entailing so much preliminary preparation that few who go out to photograph for amusement would be sufficiently enthusiastic to incur it. There are a good many degrees between improving a foreground and tethering a flock of sheep on a hillside.

No doubt vast and legitimate improvements may be effected by the judicious introduction of materials foreign to the foreground selected, but whatever they are, let the effect be *natural* and reasonably likely to have existed on the spot where they are placed. Merely planting objects on the ground without any definite idea of arrangement will not do at all; due regard must be had to the probability of their existence in that particular place, so that the ultimate result is the production of better artistic composition than unassisted Nature had provided.

The irregular edges of all paths and roadways form their most picturesque parts, so when accessories are introduced they (the edges) should not be hidden, but be left to have their own effect in the picture.

Straight lines are best avoided or used with great

discrimination; the repetition of them gives a formal appearance to a photograph unless great skill has been exercised in their management. A number of hay-makers, for instance, resting on their implements, hay-forks and rakes, chiefly inclined in one direction, has, from an artistic standpoint, a very unpleasant effect, although the attitudes may be singularly easy and unconstrained. The figures taken separately might be right enough, but a number repeating the same general pose entirely spoils the result.

Although it has been already remarked that distances by themselves are disappointing in the photograph, they have considerable value when forming a portion of a picture consisting principally of foreground; the least show of distance in such a picture increases the interest out of all proportion to its intrinsic value, as will a touch of pure white increase the apparent scale of tones in a print. It acts by virtue of contrast, and if at the same time it happens to be a pretty bit of distance there is at once a considerable increase of effect. A break in a foreground object, through which the parts beyond can be seen, is invariably an advantage. When we see a view through a door or window we get an idea of space that would otherwise be absent, and in this connexion many interiors are vastly improved, if separate photographs are taken of the views seen outside through the windows, &c., and printed in by double printing. An ordinary small sitting-room, nothing in itself, will become quite attractive if the windows are filled in by pretty views, such as are seen by looking out of them. To obtain a natural effect, the outside view should be of correct size and proportion to the interior, and printed lightly and

delicately. If the lens used for the interior is the same as used for the view, the proportion will, of course, be right, but sometimes a better effect is obtained if a longer focus lens is employed for the landscape part, especially if a very wide angle lens has been used on the interiors. Some little licence is permissible in this work. It may happen that the most suitable part of the view for introduction is not that seen from the room—a better part may be chosen without greatly infringing the proprieties. I do not know of anything that improves an interior more than this. Why the plan has not been more frequently adopted is possibly on account of its supposed difficulties, it being, instead, one of the simplest processes of double printing.

To return to landscape work proper, perhaps nothing requires more management to obtain the best effects than water in its various forms. The perfectly still mirror-like surface is unsuitable for anything but stereoscopic work, where we get the appearance of solidity and depth, absent in other kinds of pictures. The shadows of dark objects, such as trees, &c., reflected from still water, are absolutely black and void of detail, and the effect in the photograph is that of under-exposure; to avoid this, agitate the surface, so that the shadows are broken up. In rendering waterfalls, a very brief exposure for the water, and a longer for the surroundings, is advocated according to circumstances. Sometimes the principal points of effect in falling water remain pretty constant. When this happens, a proper exposure for the landscape will not overdo the water, the chalky effect so often seen is mainly due to a too short exposure being given to render details in the

foliage, &c., without considerably forcing the development which over-intensifies the brighter parts. This may be partially remedied by local reduction.

As a rule, waterfalls occur in situations that allow very little licence in choice of position for photographing them, so the best has to be made of the matter. A day with plenty of white clouds about, ensuring abundance of reflected light, is preferable to direct sunshine. Almost all negatives of such subjects can be improved by pencilling touches of high light in the proper places, and a few fine, sharp, curved lines following the course of the water will help the effect, but, like all other retouching, it must be kept within bounds—a little is a valuable addition, but too much quite spoils the picture. When there is a great flush of water the effect is less picturesque than when there is less, as it then usually flows in a large unbroken volume. With the smaller flow, projecting stones, &c., break up the stream, dividing it into numerous smaller cascades, each one of which has its own peculiar lights and shadows, which look infinitely better in the picture. The other extreme, scarcity of water, quite destroys the interest, for little dribbling rills, hardly to be perceived amongst the rocks, are scarcely worth photographing, and never convey the idea of a waterfall as it should be.

A day, or even a few hours, may make all the difference between a good and unsatisfactory representation. We should always try the happy medium. Large sheets of water are often troublesome to render satis factorily, showing as blank patches on the picture, which may be owing to the surface being ruffled by the wind, or only the sky being reflected from the point chosen for

the exposure. When possible, all large spaces of water are better for reflecting somewhat dark objects from the greater part of their area in preference to sky. This can often be managed by selecting a proper position and height for the camera. When the opposite side of a pool or lake is photographed, its reflection should not cover the entire surface, but leave off a little short of the near bank, a bit of sky intervening. It is also an advantage to have the outlines of the shadows indicated.

A very low placed camera will bring small objects in the foreground sufficiently into prominence to hide other things behind them with advantage. Much may be done to improve a picture by properly regulating the height of the camera. As a rule, a rather low stand is preferable to a tall one. It may be observed that most landscape painters sit at their work, consequently choosing a low point of sight in comparison with that adopted by photographers, which is often that most convenient for seeing the image on the focussing screen, irrespective of other considerations.

The craze for instantaneity of exposure goes a long way in producing the number of poor, weak, rubbishy negatives we see, or those without a suspicion of atmosphere. It may be taken as an invariable rule that better work is made by moderate exposures counted by seconds instead of fractions of them, than can be obtained by rapid shutter work. There is better quality in negatives that develop up smoothly and without forcing than in those that require a deal of time and coaxing to get out an image of proper printing intensity. It is in dry-plate work as in the wet collodion process that *full* exposures invariably produce the best printing negatives.

FORMULÆ.

Developer for Wet Plates with Albumen.

Sulphate of iron and ammonia	3 ounces.
Lump sugar	3 „
Strong acetic acid	6 „
Sulphate of copper	½ ounce.
Water	½ gallon.
Albumen of 3 eggs.	

Beat the albumen to a froth, and mix with half the water. The iron, sugar, and copper being dissolved in the remaining water with the acetic acid. Mix well, shake and let stand for a week, then filter. This developer improves with age.

Developer for Glass Positives and Ferrotypes.

Sulphate of iron	1½ ounces.
Nitrate of barytes	1 ounce.
Alcohol	1 „
Pure nitric acid	40 drops.
Water	16 ounces.

Dissolve the baryta entirely in boiling water before the rest of the ingredients are added, stir in the sulphate of iron while the liquid is warm, and filter. When cold, add the acid and alcohol.

Varnish for Positives.

Copal gum	40 grains.
Benzole	1 ounce.

Mix and dissolve.

Collodio-Bromide Emulsion.

(Nesbit's Formulæ.)

Plain Collodion.

Methylated alcohol 2 ounces 6 drachms.
Methylated ether... 2¼ „
Pyroxyline (high temperature) 60 grains.

Bromising Solution.

Methylated alcohol ..... 1 ounce.
Water ..... about 100 minims.
Bromide of ammonium ..... 63 grains.

Sensitising Solution.

Silver nitrate pure ..... 100 grains.
Distilled water ..... 60 minims.

The bromising solution should be first added to the plain collodion, and the sensitising solution added a little at a time, well shaking between each addition. After being set aside some hours (shaking occasionally), the mixture should be poured into a shallow dish to set. When set, it should be washed till the soluble salts are removed. This being performed, the pellicle should be squeezed in a piece of calico to get rid of as much of the water as possible, and then dried, either by the application of heat or spontaneously. For use, the quantity of pellicle obtained by the above quantities should be dissolved in 4 ounces of alcohol and 4 ounces of ether, when, after filtration through swan's down calico, it is ready for use.

Developer for Collodio-Bromide Emulsion Plates.

A.—Pyrogallic acid.....	50 grains.
Alcohol...	½ ounce
B.—Bromide of potassium	10 grains.
Water	1 ounce.
C.—Liquor ammonia.....	1 drachm.
Or Carbonate of ammonia	2 grains.
Water to make	1 ounce.

First pour a little spirit over the film to moisten it, then for each half ounce of developer take twenty drops of A, eight drops of B, eight drops of C; when the details are out add double quantities of B and C.

Acid Silver to Intensify Collodion Emulsion.

Silver nitrate	30 grains.
Citric acid.....	15 minims.
Nitric acid	15 „
Water (distilled)	1 ounce.

To intensify, add two or three drops of this to a drachm of pyrogallic acid solution of three or four grains to the ounce of water till sufficient density is attained.

Gelatino-Bromide Emulsion.

A.—Bromide of Potassium	270 grains.
Iodide of Potassium	15 „
Dilute hydrochloric acid	20 minims.
Distilled water	3 ounces.
Tincture of iodine to pale sherry colour.	

B.—Silver nitrate ..... 356 grains.
Distilled water ..... 1 ounce.
C.—Gelatine (soft)..... 1 drachm.
Distilled water ..... 2 ounces.
Dissolve.

Add the bromide solution to the silver and gelatine gradually, and boil in a jar in a water bath, until just blue by transmitted light, when a little is taken on a piece of glass and examined by gas light, then add—

Hard gelatine ..... 320 grains.
Distilled water ..... 4 ounces.

Let it set and squeeze through some coarse canvas or net, and wash for some hours (four or five), then drain it well, melt, and add six drachms spirits of wine, and two or three grains of chrome alum, dissolve in a little water, let the emulsion stand for a week, then melt, filter through swan's down calico, and coat the plates.

Orthochromatic Emulsion.

The addition of 30 minims of a solution of erythrosine in alcohol, of a strength of 1 grain of erythrosine to 1 ounce of spirit, to the bromide solution in the above formula will produce an orthochromatic emulsion.

Carbonate of Soda Developer.

A.—Pure carbonate of soda... 6 ounces.
Water ..... 80 „
B.—Pyrogallic acid ..... 1 „
Sulphite of soda ..... 6 „
Sulphuric acid ..... 1 drachm.
Water ..... 1 ounce.
For use equal parts of each.

Pyro-Ammonia Developer.

10 per cent. solutions of pyrogallic acid, liquor ammonia, and bromide of ammonium being used, take

Pyrogallic acid solution	74 minims
Bromide ammonium solution	100 „
Ammonia solution	180 „
Water.....	4 ounces.

Dr. Monkhoven's Intensifier.

Bichloride of mercury	10 grains.
Bromide of Potassium	10 „
Water	1 ounce.

Let the negative whiten throughout in this solution, then well wash and place in

Pure crystallised cyanide of Potassium	10 grains.
Nitrate of silver	10 „
Distilled water	1 ounce.

The precipitate found when the cyanide is added to the silver should be nearly, but not quite, dissolved, if all dissolves add a little more silver nitrate in solution, the negative to be kept in this until it is blackened throughout.

Or,

The mercury bath, to be followed by a moderately strong solution of sulphite of soda, well washing between.

Quickly Made Negative Varnish.

White hard spirit varnish	1 part.
Methylated spirit	2 parts.

Or,

Shellac (orange).....	1 lb. (broken small.)
Sandarac.....	1 ounce.
Methylated spirit	1 gallon.

Set in a warm place for a week, frequently shaking. Let stand to subside and filter.

Encaustic Paste.

White wax	2 ounces.
Oil of lavender	2 drachms.
Turpentine	1 ounce.
Benzole.....	1 „

Dissolve the wax in the turpentine and oil of lavender; as it is cooling add the benzole.

Acetate Toning Bath for Albumen Prints.

Acetate of soda	30 grains.
Chloride of gold	2 „
Water (hot)	10 ounces.

This will be ready for use in three days; improves by use.

Lime Toning Bath for Albumen Prints.

Chloride of gold	6 grains
Lime Water ..... (or sufficient to neutralise.)	4 ounces.
Water.....	40 „

Ready for use in an hour; does not keep long.

Retouching Medium.

Gum Dammar.....	2 drachms.
Turpentine	1 ounce.
Benzole	1 „

Varnish for Paper.

Canada balsam	1 ounce.
Turpentine	2 „

Size the paper before varnishing.

Reducing Over-printed Silver Prints.

After the prints have been washed and dried, place them in a bath composed of

Bichloride of mercury	3 grains
Bromide of potassium	3 „
Water	1 ounce.

Until sufficiently reduced, then wash well and dry.

Blue Paper.

1.—Ferridcyanide of potassium	70 grains.
Water	1 ounce.
2.—Ammonia citrate of iron	100 grains.
Citric acid	5 „
Water	1 ounce.

Mix equal parts just before use, and apply with a sponge or brush, and dry in the dark.

Plain Salted Paper for Printing Line Subjects by Development.

Saxe paper floated for one minute on

Chloride of ammonium	2 drachms.
Citrate of soda	2 „
Citric acid to make it just acid.	
Water	12 ounces.

Then dry and float three minutes on a bath of

Silver nitrate	5 drachms.

Water distilled	12 ounces
Citric acid	10 grains.

Prepare the paper in the dark room; exposure from half to two minutes; develop by

A.—Acetate of lead	1 drachm.
Water	12½ ounces.
B.—Gallic acid	1 drachm.
Alcohol	1 ounce.

To 4000 parts of water add 50 parts solution A and 8 parts solution B. Keep the prints moving during development, which will be in from ten to fifteen minutes, then fix in

Hyposulphite of soda	4 ounces.
Water	12 „

For a quarter of an hour, and well wash. Can be toned with gold if gallic acid is well washed off first.

TABLE OF THE SYMBOLS, ATOMICITY, ATOMIC, AND EQUIVALENT WEIGHTS OF THE ELEMENTS.

Name.	Symbol and Atomicity.	Atomic Weight.	Equivalent Weight.
Aluminium	Al^{iii}	27·4	9·13
Antimony (Stibium)	Sb^{iii}	122·0	40·66
Arsenic	As^{iii}	75·0	25·0
Barium	Ba^{ii}	137·0	68·5
Bismuth	Bi^{iii}	208·0	69·33
Boron	B^{iii}	11·0	3·66
Bromine	Br^{i}	80·0	80·0
Cadmium	Cd^{ii}	112·0	56·0
Cæsium	Cs^{i}	133·0	133·0
Calcium	Ca^{ii}	40·0	20·0
Carbon	C^{iv}	12·0	3·0
Cerium	Ce^{ii}	92·0	46·0
Chlorine	Cl^{i}	35·5	35·5
Chromium	Cr^{ii}	52·2	26·1
Cobalt	Co^{ii}	58·8	29·4
Columbium (or Niobium)	Cb^{v}	94·0	18·8
Copper (Cuprum) — Cuprosum	Cu^{i}	63·4	63·4
Copper (Cuprum) — Cupricum	Cu^{ii}	63·4	31·7
Davyum	Da	...	...
Didymium	Di^{ii}	95·0	47·5
Erbium	E^{ii}	112·6	56·3
Fluorine	Fl^{i}	19·0	19·0
Gallium	Ga	68·0	...
Glucinum	G^{ii}	9·4	4·7
Gold (Aurum)	Au^{iii}	196·0	65·33
Hydrogen	H^{i}	1·0	1·0
Indium	In^{iii}	113·4	37·8
Iodine	I^{i}	127·0	127·0
Iridium	Ir^{iv}	198·0	49·5
Iron (Ferrum) — Ferrosum	Fe^{ii}	56·0	28·0
Iron (Ferrum) — Ferricum	Fe^{iii}	56·0	18·66
Lanthanum	La^{ii}	92·8	46·4
Lead (Plumbum)	Pb^{ii}	207·0	103·5
Lithium	Li^{i}	7·0	7·0
Magnesium	Mg^{ii}	24·0	12·0
Manganese	Mn^{ii}	55·0	27·5
Mercury (Hydrargyrum) — Mercurosum	Hg	200·0	200·0
Mercury (Hydrargyrum) — Mercuricum	Hg^{ii}	200·0	100·0
Molybdenum	Mo^{ii}	92·0	46·0
Nickel	Ni^{ii}	58·8	29·4
Nitrogen	N^{iii}	14·0	4·66
Osmium	Os^{iv}	199·0	49·75
Oxygen	O^{ii}	16·0	8·0
Palladium	Pd^{ii}	106·5	53·25

TABLE OF SYMBOLS, &c.—CONTINUED.

NAME.	Symbol and Atomicity.	Atomic Weight.	Equivalent Weight.
Phosphorus	P^{iii}	31·0	10·33
Platinum { Platinosum	Pt^{ii}	197·4	98·7
Platinum { Platinicum	Pt^{iv}	197·4	49·35
Potassium (Kalium)	K	39·1	39·1
Rhodium	Rh^{ii}	104·4	52·2
Rubidium	Rb^{i}	85·4	85·4
Ruthenium	Ru^{iv}	104·0	26·0
Selenium	Se^{ii}	79·4	39·7
Silicium (or Silicon)	Si^{iv}	28·0	7·0
Silver (Argentum)	Ag^{i}	108·0	108·0
Sodium (Natrium)	Na^{i}	23·0	23·0
Strontium	Sr^{ii}	87·5	43·75
Sulphur	S^{ii}	32·0	16·0
Tantalum	Ta^{v}	182·0	36·4
Tellurium	Te^{ii}	128·0	64·0
Thallium	Te^{i}	204·0	204·0
Thorium (or Thorinum)	Th^{iv}	231·5	57·87
Tin (Stannum) { Stannosum	Sn^{ii}	118·0	59·0
Tin (Stannum) { Stannicum	Sn^{iv}	118·0	29·5
Titanium	Ti^{iv}	50·0	12·5
Tungsten (Wolfram)	W^{iv}	184·0	46·0
Uranium	Ur^{ii}	120·0	60·0
Vanadium	V^{iii}	51·3	17·1
Yttrium	Y^{ii}	61·7	30·85
Zinc	Zn^{ii}	65·2	32·6
Zirconium	Zr^{iv}	89·6	22·4

TABLE OF SYMBOLS OF THE MORE IMPORTANT COMPOUNDS USED IN PHOTOGRAPHY.

NAME.	SYMBOL.	
Acid, Acetic (Cryst.)	$H, C_2 H_3 O_2$	60
,, Citric	$H_3, C_6 H_5 O_7 + H_2 O$	210
,, Formic	H, CHO_2	46
,, Gallic	$H, C_7 H_5 O_5$	170
,, Hydriodic	HI	128
,, Hydrobromic	$H Br$	81
Hydrochloric	$H Cl$	36·5
, Hydrocyanic	$H CN$	27
, Hydrosulphuric	$H_2 S$	34
, Nitric	H, NO_3	63
,, Oxalic	$H_2 C_2 O_4 + 2 H_2 O$	126
Pyrogallic	$H_3 C_6 H_3 O_3$	126
,, Sulphuric	$H_2 SO_4$	98
,, Sulphurous	$H_2 SO_3$	82
,, Tannic	$H_4 C_{27} H_{18} O_{17}$	618
,, Tartaric	$H_4 C_4 H_2 O_6$	150
Alum, Chrome	$Cr K (SO_4)_2 12 H_2 O$	499·3
,, (Potash)	$Al K (SO_4)_2 12 H_2 O$	474·5
Ammonium, Bromide	$NH_4 Br$	98
,, Carbonate	$(NH_4)_2 CO_3$	96
,, Chloride	$NH_4 Cl$	53·5
,, Iodide	$NH_4 I$	145
,, Nitrate	NH_4, NO_3	80
,, Sulphydrate of	NH_4, HS	51
,, Sulphocyanide of	NH_4, CNS	76
Barium, Bromide	$Ba Br_2$	297
,, Chloride (Cryst.)	$Ba, Cl_2 + 2 H_2 O$	244
,, Iodide	$Ba I_2$	391
,, Nitrate	$Ba, (NO_3)_2$	261
Cadmium, Bromide (Cryst.)	$Cd, Br_2 + 4 H_2 O$	344
,, Chloride	$Cd Cl_2$	183
,, Iodide	$Cd I_2$	366
Calcium, Bromide (Cryst.)	$Ca Br_2 + 4 H_2 O$	272
,, Chloride	$Ca Cl_2$	111
,, Iodide	$Ca I_2$	294
Copper, Bromide (cupric)	$Cu Br_2$	223·4
,, Chloride ,,	$Cu Cl_2 2 H_2 O$	170·4
,, Sulphate ,,	$Cu SO_4 5 H_2 O$	249·4
Gold, Terchloride	$Au Cl_3$	302·5
Iron, Chloride (ferrous)	$Fe Cl_2$	127
,, ,, (ferric)	$Fe_2 Cl_6$	325
,, Iodide	$Fe I_2$	310
,, Oxalate (ferrous)	$Fe C_2 O_4$	144
,, ,, (ferric)	$Fe_2 (C_2 O_4)_3$	376
,, Sulphate (ferrous)	$Fe SO_4 + 7 H_2 O$	278
,, ,, (ferric)	$Fe_2 (SO_4)_3$	400
,, Ammonia-sulphate	$Fe SO_4, (NH_4)_2 SO_4 + 6 H_2 O$	392
Lead, Acetate (Cryst.)	$Pb, (C_2 H_3 O_2)_2 + H_2 O$	343

TABLES OF SYMBOLS, &c.—CONTINUED.

NAME.	SYMBOL.	
Lead, Nitrate	$Pb, (NO_3)_2$	331
Lithium, Bromide	$Li\ Br$	87
,, Chloride	$Li\ Cl$	42·5
,, Iodide	$Li\ I$	134
Magnesium, Bromide	$Mg\ Br_2$	184
,, Chloride	$Mg\ Cl_2$	95
,, Iodide	$Mg\ I_2$	278
Mercury, Chloride (Mercuric)	$Hg\ Cl_2$	271
Platinum, Chloride	$Pt\ Cl_4$	339·4
Potassium, Bichromate	$K_2\ Cr_2\ O_7$	294·6
,, Bromide	$K\ Br$	119·1
,, Carbonate	$K_2\ CO_3$	138·2
,, Chloride	$K\ Cl$	74·6
,, Citrate	$K_3\ C_6\ H_5\ O_7 + H_2\ O$	324·3
,, Cyanide	$K\ C\ N$	65·1
,, Ferridcyanide	$K_6\ Fe_2\ Cy_{12}$	658·6
,, Ferrocyanide	$K_4\ Fe\ Cy_6$	368·4
,, Hydrate	$K\ OH$	56·1
, Iodide	$K\ I$	166·1
,, Nitrate	$K\ NO_3$	101·1
,, Permanganate	$K_2\ Mn_2\ O_8$	316·2
Silver, Acetate	$Ag\ C_2\ H_3\ O_2$	167
,, Bromide	$Ag\ Br$	188
,, Carbonate	$Ag_2\ CO_3$	276
,, Chloride	$Ag\ Cl$	143·5
,, Citrate	$Ag_3\ C_6H_5O_7$	513
,, Fluoride	$Ag\ Fl$	127
,, Iodide	$Ag\ I$	235
,, Nitrate	$Ag\ NO_3$	170
,, Oxalate	$Ag_2\ C_2\ O_4$	304
,, Oxide	$Ag_2\ O$	232
,, Sulphide	$Ag_2\ S$	248
Sodium, Acetate (Cryst.)	$Na\ C_2\ H_3\ O_2\ 3\ H_2\ O$	136
,, Biborate (Borax)	$Na_2\ B_4\ O_7 + 10\ H_2\ O$	382
,, Bromide	$Na\ Br$	103
,, Carbonate (Cryst.)	$Na_2\ CO_3 + 10\ H_2\ O$	286
,, Chloride	$Na\ Cl$	58·5
,, Citrate	$2\ (Na_3\ C_6\ H_5\ O_7)\ 11\ H_2\ O$	714
,, Hyposulphite (Cryst.)	$Na_2\ S_2\ O_3 + 5\ H_2\ O$	248
,, Iodide	$Na\ I$	150
,, Sulphite	$Na_2\ SO_3\ 7\ H_2\ O$	252
Strontium, Bromide	$Sr\ Br_2$	247·5
,, Chloride	$Sr\ Cl_2$	158·5
,, Iodide	$Sr\ I_2$	341·5
Uranium, Bromide	$U\ Br_2\ 4\ H_2\ O$	352
,, Nitrate	$U_2\ O_2\ (NO_3)_2\ 6\ H_2\ O$	504
Zinc, Bromide	$Zn\ Br_2$	225·2
,, Chloride	$Zn\ Cl_2$	136·2
,, Iodide	$Zn\ I_2$	319·2

'UNIFORM SYSTEM' NUMBERS FOR STOPS FROM $\frac{f}{1}$ TO $\frac{f}{100}$.

In the following table Mr. S. A. Warburton has calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the 'uniform system' of the Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No.
1	$\frac{1}{16}$
$1\frac{1}{4}$	·097
1·414	$\frac{1}{8}$
$1\frac{1}{2}$	·140
$1\frac{3}{4}$	·191
2	$\frac{1}{4}$
$2\frac{1}{4}$	·316
$2\frac{1}{2}$	·390
2·828	$\frac{1}{2}$
$2\frac{3}{4}$	·472
3	·562
$3\frac{1}{4}$	·660
$3\frac{1}{2}$	·765
$3\frac{3}{4}$	·878
4	1·00
$4\frac{1}{4}$	1·12
$4\frac{1}{2}$	1·26
$4\frac{3}{4}$	1·41
5	1·56
$5\frac{1}{4}$	1·72
$5\frac{1}{2}$	1·89
5·656	2
$5\frac{3}{4}$	2·06
6	2·25
$6\frac{1}{4}$	2·44
$6\frac{1}{2}$	2·64
$6\frac{3}{4}$	2·84
7	3·06
$7\frac{1}{4}$	3·28
$7\frac{1}{2}$	3·51
$7\frac{3}{4}$	3·75
8	4
$8\frac{1}{4}$	4·25
$8\frac{1}{2}$	4·51
$8\frac{3}{4}$	4·78
9	5·06
$9\frac{1}{4}$	5·34
$9\frac{1}{2}$	5·64
$9\frac{3}{4}$	5·94
10	6·25
11	7·56
11·31	8
12	9·00
13	10·56
14	12·25
15	14·06
16	16
17	18·06
18	20·25
19	22·56
20	25·00
21	27·56
22	30·25
22·62	32
23	33·06
24	36·00
25	39·06
26	42·25
27	45·56
28	49·00
29	52·56
30	56·25
31	60·06
32	64
33	68·06
34	72·25
35	76·56
36	81·00
37	85·56
38	90·25
39	95·06
40	100·00
41	105·06
42	110·25
43	115·56
44	121·00
45	126·56
45·25	128
46	132·25
47	138·06
48	144·00
49	150·06
50	156·25
51	162·56
52	169·00
53	175·56
54	182·25
55	189·06
56	196·00
57	203·06
58	210·25
59	217·56
60	225·00
61	232·56
;	240 25
63	248·06
64	256
65	264·06
66	272·25
67	280·56
68	289·00
69	297·56
70	306·25
71	315·06
72	324·00
73	333·06
74	342·25
75	351·56
76	361·00
77	370·56
78	380·25
79	390·06
80	400·00
81	410·06
82	420·25
83	430·56
84	440·00
85	451·56
86	462·25
87	473·06
88	484·00
89	495·06
90	506·25
90· 50	512
91	517·56
92	529·00
93	540·56
94	552·25
95	564·06
96	576·00
97	588·06
98	600·25
99	612·56
100	625·00

WEIGHTS AND MEASURES.

APOTHECARIES' WEIGHT.

SOLID MEASURE.

20 Grains	= 1 Scruple	= 20 Grains.	
3 Scruples	= 1 Drachm	= 60	,,
8 Drachms	= 1 Ounce	= 480	,,
12 Ounces	= 1 Pound	= 5760	,,

FLUID.

60 Minims	= 1 Fluid Drachm.
8 Drachms	= 1 Ounce.
20 Ounces	= 1 Pint
8 Pints	= 1 Gallon gall.

The above weights are those usually adopted in formulæ.

All Chemicals are usually sold by Avoirdupois Weight, in which there are 437½ grains to the ounce.

The Precious Metals, such as Silver and Gold, are sold by Troy Weight, containing 480 grains to the ounce.

FRENCH WEIGHTS AND MEASURES,

AND THEIR EQUIVALENTS IN ENGLISH.

1 Cubic Centimètre	= 17 minims nearly.	
3½ ,,	,,	= 1 drachm.
28·4 ,,	,,	= 1 ounce.
50 ,,	,,	= 1 ounce, 6 drachms, 5 minims.
100 ,,	,,	= 3 ounces, 4 drachms, 9 minims.
1000 ,,	,,	= 35 ounces, 1 drachm, 36 minims.
or 1 litre, = to 61 cubic inches		

The unit of French liquid measures is a cubic *centimètre.*

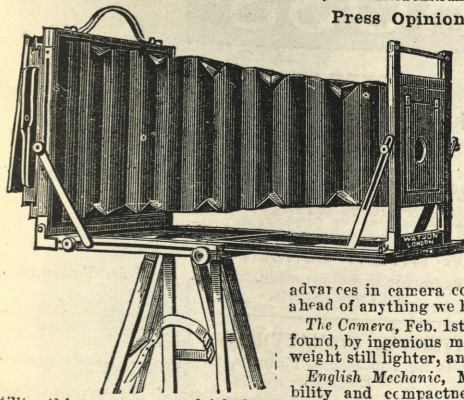
A cubic *centimètre* of water measures nearly 17 minims (16·896); it weighs 15·4 grains, or 1 *gramme.* A cubic *inch* of water weighs 252·5 grains.

The unit of French weights is the gramme = 15·4 grains; thus a drachm (60 grains) is nearly 4 grammes (3·88). An easy way to convert grammes into English weight is to divide the sum by 4, which gives the equivalent in drachms very nearly thus:—

Grammes.		Drachms.	Oz.	Drachm.	Grains.
100	÷ 4 =	25 =	3	. 1	+ 43

WATSON'S ACME CAMERAS & RECTILINEAR LENSES.

NOTICE.—The salient features of this Camera being protected by Patents, no other House can supply a similarly constructed Instrument.



Press Opinions of the Acme Camera:

British Journal of Photography, Jan. 4th, 1889.—'It folds into a smaller compass, and is lighter and more portable than any pattern we have yet seen.'

Amateur Photographer, Jan. 7th, 1889.—'A wonderful, compact, and fairy-like instrument, exhibiting several new and important features. Sure to be a favourite with tourist photographers.'

Photography, Jan. 17th, 1890.—'One of the greatest advances in camera construction yet reached, away ahead of anything we have seen.'

The Camera, Feb. 1st, 1889.—'Messrs. Watson have found, by ingenious modifications, how to make the weight still lighter, and the rigid still more firm.'

English Mechanic, March 1st 1889.—'For portability and compactness, combined with practical utility, this camera may fairly be said to take the lead, and to be deserving of the title "Acme."'

PRICE LIST.

	6½×4¾	7½×5	8½×6½	10×8	12×10	15×12
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
'Acme' Camera and three double slides	9 12 0	10 0 0	12 5 0	14 0 0	16 12 6	21 0 0
Rapid Rectilinear Lens with Iris diaphragm	4 0 0	4 10 0	5 0 0	6 15 0	8 15 0	11 10 0
Solid Leather Travelling Case, with spring lock	1 15 0	1 15 0	2 2 0	2 10 0	3 0 0	3 15 0
Rotating Turntable in base, and Tripod Stand	2 2 0	2 2 0	2 2 0	2 10 0	2 15 0	3 3 0
	17 9 0	18 7 0	21 9 0	25 15 0	31 2 6	39 8 0

The above prices are subject to 10 per cent. discount for Cash with Order.

28 PRIZE MEDALS AWARDED,

Including Two Gold Medals, Paris Universal Exhibition, 1889; the Medals of the Glasgow and Amsterdam Photo Societies, 1891; Gold Medal, Budapesth, 1890; the Gold Medal, Melbourne International Exhibition, 1888; the only Medal for Cameras, and the only Medal for Studio and Tripod Stands at the Great Photographic Exhibition, Crystal Palace, London, 1888; the only Medal for Photographic Apparatus, Adelaide International Exhibition, 1887; and the only Gold Medal for Photographic Apparatus, Liverpool International Exhibition, 1886.

A Fully Illustrated and Descriptive CATALOGUE of Cameras, Lenses, and every Accessory Apparatus and Material requisite in Photography sent post free to any address on application.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON,

And 87 Swanston Street, Melbourne, Australia.

STEAM FACTORIES: 9, 10, 11, 16 & 17 FULWOOD'S RENTS, W.C.

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CELEBRATED

PORTRAIT AND VIEW LENSES.

Gold Medals and Highest Awards at all Great Exhibitions. Used by Leading Photographers throughout the World.

ROSS' NEW PATENT CONCENTRIC LENS.

The greatest advance in Photographic Lenses yet made. F—16. Send for Testimonials and Press Reports.

ROSS' UNIVERSAL SYMMETRICAL LENSES.

(Extra Rapid). A new series for Landscapes, Portraits, Groups, and Instantaneous. F—5,657.

ROSS' RAPID SYMMETRICAL LENSES.

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The most popular Lenses for Landscapes, Architecture, and Copying. F—16.

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(New Series.) For Landscapes, Architecture, and Confined Situations. F—16.

ROSS' NEW WIDE-ANGLE SINGLE LENSES.

Introduced for purely Landscape purposes. Flat Field and Brilliant Image. F—16

ROSS' IMPROVED PORTRAIT LENSES.

Cabinets and C. de V.'s. Invaluable for either standing or sitting figures.

ZEISS PATENT ANASTIGMATIC LENSES.

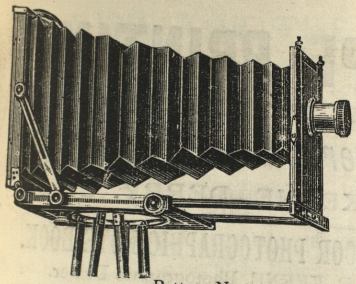
Manufactured by Ross & Co. Sole manufacturing Licencees for the British Empire.

Send for Illustrated Catalogues before purchasing elsewhere.

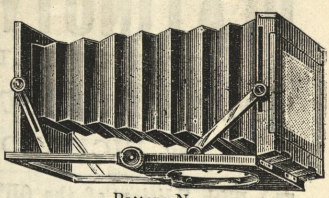
ROSS & CO.,

112 NEW BOND STREET, LONDON, W.

WORKS—CLAPHAM COMMON.



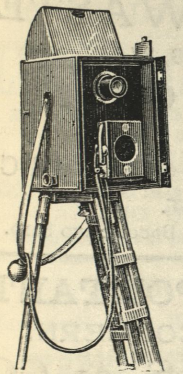
Pattern No. 1.



Pattern No. 2.

ROSS'

DOUBLE EXTENSION CAMERAS



Size.	Pattern No. 1. With one Double Back.	Pattern No. 1. With three Double Backs.	Pattern No. 2. With one Double Back.	Pattern No. 2. With three Double Backs.
$6\frac{1}{2}\times4\frac{3}{4}$	£6 11 0	£8 15 0	£5 0 0	£7 4 0
$7\frac{1}{2}\times5$	7 9 0	9 13 0	5 16 0	7 12 0
$8\frac{1}{2}\times6\frac{1}{2}$	8 1 0	10 11 0	7 3 6	9 5 6
10×8	9 1 0	12 5 0	8 14 0	11 6 0

TURNTABLE AND LEGS, 37/6 EXTRA.

NEW DIVIDED CAMERA

With full-sized Finder, &c.

Has all the movements of an ordinary Camera, along with several distinct advantages of its own.

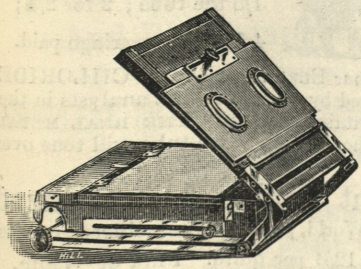
Prices, with a Thornton-Pickard Shutter:—

Plates.	Outside Size.	Fitted with a pair of Ross' Rap. Sym. Lens.	
$4\frac{1}{4}\times3\frac{1}{4}$ ...	$7\frac{1}{2}\times5\frac{3}{4}\times7\frac{1}{2}$ ...	5×4, 6 in. focus ...	£18 18 0
5 ×4 ...	8 ×$6\frac{1}{2}$×$8\frac{3}{4}$ ...	6×5, $7\frac{1}{2}$,, ...	22 0 0
$6\frac{1}{2}\times4\frac{3}{4}$ ...	$11\frac{1}{2}$×8 ×$10\frac{1}{2}$ ...	8×5, 9 ,, ...	24 10 0

The Wollaston Special Shutter, £3 3*s.* extra. Iris Diaphragms, from 10*s.* extra.

Double Swing Back, from £1 5*s.*

TEN PER CENT. DISCOUNT FOR CASH.



STEREOSCOPIC CAMERAS.

Size	With one Double Slide.	With three Double Slides.
$6\frac{1}{2}\times4\frac{3}{4}$	£7 2 0	£9 6 0
$7\frac{1}{2}\times5$	7 10 0	9 14 0
$8\frac{1}{2}\times6\frac{1}{2}$	8 17 6	11 7 6
10×8	10 10 0	13 14 0

STUDIO CAMERAS

of the most approved Patterns.

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MANUFACTORY—CLAPHAM COMMON.

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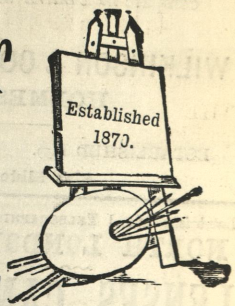

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Portrait Painting in Oils of every Description.

Finishing in Water Colours on Paper or Opal.

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THE 'LONDON' PLATES retain, unchallenged, the foremost position which they secured on their first introduction fifteen years ago. They have outlived innumerable competitors, and are now, as heretofore, the universal standard of excellence and comparison. For rapidity, uniformity, technical excellence of preparation, and certainty of yielding good results, the reputation of the 'LONDON' PLATES has become proverbial.

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PRICES per half-doz., in Light-tight, Cloth-covered, Grooved Boxes.

4¼ × 3¼	2/-	7½ × 5	5/6
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KEYSTONE DRY-PLATE WORKS.

Wayne Junction,
PHILADELPHIA, U.S.

[*See following page.*

CARBUTT'S DRY PLATES AND "CELLULOID" FILMS.

TRADE MARK

The Perfection of Film Photography.

PRICE LIST OF CARBUTT'S FLEXIBLE NEGATIVE FILMS.

'B' Landscape, Sen. 16. Orthochromatic, Sen. 23 to 27. 'Special,' Sen. 23 to 25. 'Eclipse,' Sen. 27.

ENGLISH MEASURE.

Inches.		American Money.	English Money.
3¼ × 4¼	... Per doz.	$ 55	... 2/3
4 × 5	... ,,	80	... 3/4
4¼ × 6½	... ,,	1 10	... 4/7
4¾ × 6½	... ,,	1 20	... 5/-
5 × 7	... ,,	1 40	... 5/10
5 × 7½	... ,,	1 50	... 6/3
5 × 8	... ,,	1 55	... 6/6
6½ × 8½	... ,,	2 10	... 8/9
8 × 10	... ,,	3 00	... 12/6
10 × 12	... ,,	4 75	... 19/8
11 × 14	... ,,	6 25	... 26/-

For intermediate sizes, take price of next size larger.

FRENCH MEASURE.

Centimetres.		American Money.	French Money.
9 × 12	... Per doz.	$ 80	... fr. 4
13 × 18	... ,,	1 40	... 7
12 × 16½	... ,,	1 20	... 6
12 × 20	... ,,	1 50	... 7 50
18 × 24	... ,,	2 85	... 14 25
21 × 27	... ,,	3 10	... 15 50
24 × 30	... ,,	4 30	... 21 50
27 × 33	... ,,	4 95	... 24 75

For the Moessard Panoramic Camera.

8 × 28 c/m	Per doz.	$1 30	... fr. 6 50
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THESE FILMS REQUIRE EXACTLY the SAME TREATMENT as DRY PLATES.

NO HALATION. NO RISK OF BREAKAGE.

Mr. JOHN CARBUTT. Philadelphia, Pa., Aug. 21, 1891.

DEAR SIR,—The ORTHOCHROMATIC 18×48 Films and 18×22 Plates I have been using in my work on the Pennsylvania Railroad are of such fine quality that I feel that I should let you know of it. They possess all the qualities of a fine wet plate and are very uniform, giving graduations in the foliage that I have not seen since I used your 'A' Plates in Egypt, Arabia, and Palestine, in 1881. During a recent trip through Mexico with Mr. John L Stoddard, I found the Orthochromatic Plates and Films far superior to the ordinary for distant mountains and snow-capped volcanos, and especially so when using a colour screen.

Please advise me when I can expect more of the 18×22 as I will soon have used up the four-dozen now on hand.

Yours very truly, WILLIAM H. RAU.

SEE LIST OF AGENCIES ON ANOTHER PAGE.

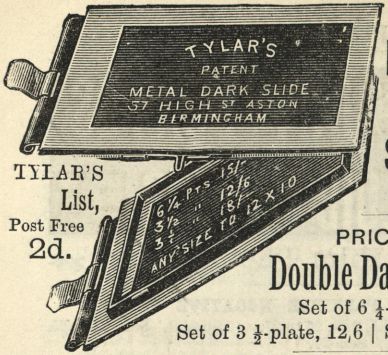
Manufactured by JOHN CARBUTT

(Pioneer Manufacturer of Gelatino-Bromide, & Orthochromatic Plates in America),

KEYSTONE DRY-PLATE WORKS.

Wayne Junction, PHILADELPHIA, U.S.

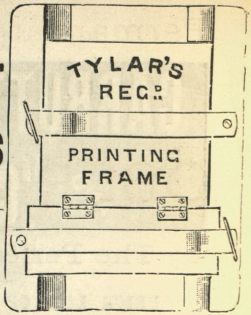
[See preceding page.



TYLAR'S List, Post Free 2d.

TYLAR'S METAL DARK SLIDES

Are A 1.



PRICES OF

Double Dark Slides.

Set of 6 ¼-plate, 15/–

Set of 3 ½-plate, 12/6 | Set of 3 ¼-plate, 18/–. Fitting extra.

TYLAR'S NEW PATENT SINGLE METAL DARK SLIDES.

Shutters entirely withdraw. ¼-plate, 15|- per doz.; ½-plate, 24|- per doz.

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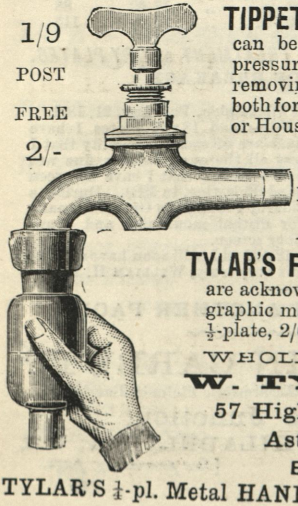
1/9 POST FREE 2/-



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can be attached to any tap by simple pressure, and is thoroughly efficient for removing foreign matter from the water, both for use in Photographic manipulations or Household purposes. 1/9; post free, 2/-.

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Nickel plated, strong, and durable. Price 1/6 box of 12; post free, 1/8.

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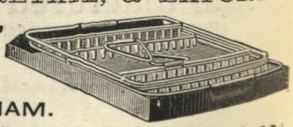
Aston,
BIRMINGHAM.



TYLAR'S ¼-pl. Metal HAND CAMERAS, double finders, 12/6 & 15/-

A FEW WORDS
ON
HAND CAMERAS.

DEAR READER,—Did you ever know a cyclist to be satisfied with his "Machine" for more than a year? My experience of cyclists is, that they are always changing, and it is quite amusing to hear their arguments in favour of every new machine they get. Well, it is just about the same with Hand Camera men—or worse. I never knew a man yet who was satisfied with a Magazine Hand Camera for more than a season. Of course, they were delighted when they got their last "latest novelty," and sang its praises for a week or two; then something goes wrong, and they wish to part with it to get another of a different pattern. But how is it that the same thing does not apply in the case of ordinary Cameras? Why, because there is no bother with magazines or trouble with unnecessary complications. When a man buys a good Half-plate or a Whole-plate Camera he is usually satisfied for years, his only trouble then is the weight; but with one of my Patent Cameras and Barnett's Dark Slides for Half-plates he has no trouble at all, for he knows he has the lightest practical Camera on earth. *For further particulars see Catalogue.*

Dark Slides are, without doubt, the most practical of all plate-holders, though the English patterns are far too heavy and clumsy, and when they are well made, as they ought to be, they are frightfully expensive; indeed, they are made to-day without the slightest improvements on those of thirty-five years ago. My Practical Hand Camera is not a Magazine, nor is it a fixed focus. It is provided with a perfect double rack and pinion movement, focus index, and a focussing screen, which latter may be used or left at home. Plates or films may be used with equal advantage, no sheaths or paper backing to bother with; you can go out with just as many plates as you wish—say two or three, half-a-dozen, or twenty, if you like. The Camera may be used in the Hand for Snap Shots, or on a Tripod for time exposures like any ordinary Camera. Any suitable lens may be used in it, but the one which I supply is a Rapid Doublet equal to any in the market. The Shutter is Kershaw's Patent, adjustable for speed.

PRICE: Quarter-plate Size, without Lens, **55s.**
With Lens and View Meter, complete, **£4 10s.**
Stereoscopic Size, **£4.** Lenses extra.

Hand Camera Pamphlet free per post.

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